

## **Second Annual Conference GIS Educators in Maine**

**November 13, 2009**

### **Integrating Google Earth with GIS**

Chris Halsted, Maine Department of Environmental Protection

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## Introduction:

- Google Earth is a great, free tool for overlaying multiple datasets from many different sources and from many different formats.
  - Zero software cost
  - No additional network or hardware infrastructure costs
  - Developing the projects can take as little as a couple of hours because so much data is already available for free.
  - **Anyone can do it.**
  - NO CODE or KML required for this demo
  - We will not spend time learning how to use Google Earth itself. Basic Google Earth navigation and search skills are assumed. For additional help check out:
    - [Google Earth Introduction](#)
    - [Google Earth Help](#)
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## Demo of Google Earth Projects at Maine DEP:

- Maine DEP [Data and Maps](#) web page
    - [Remediation Sites \(Institutional Controls\) Database](#) 
    - [Biomonitoring Stream and Wetland Sampling Data](#) 
    - [Hazardous Oil Spill System \(HOSS\) Spill Sites](#) 
    - [Wastewater Facilities and Outfalls \(MEPDES\)](#) 
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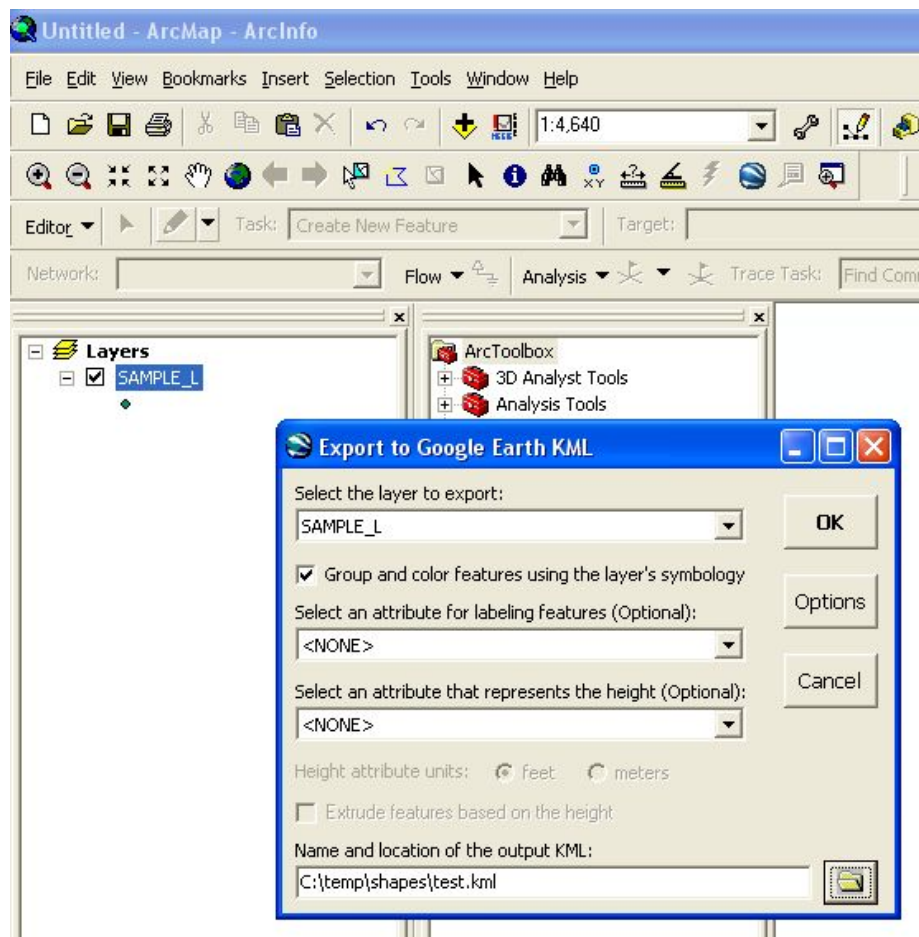
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## Getting your data to Google Earth:

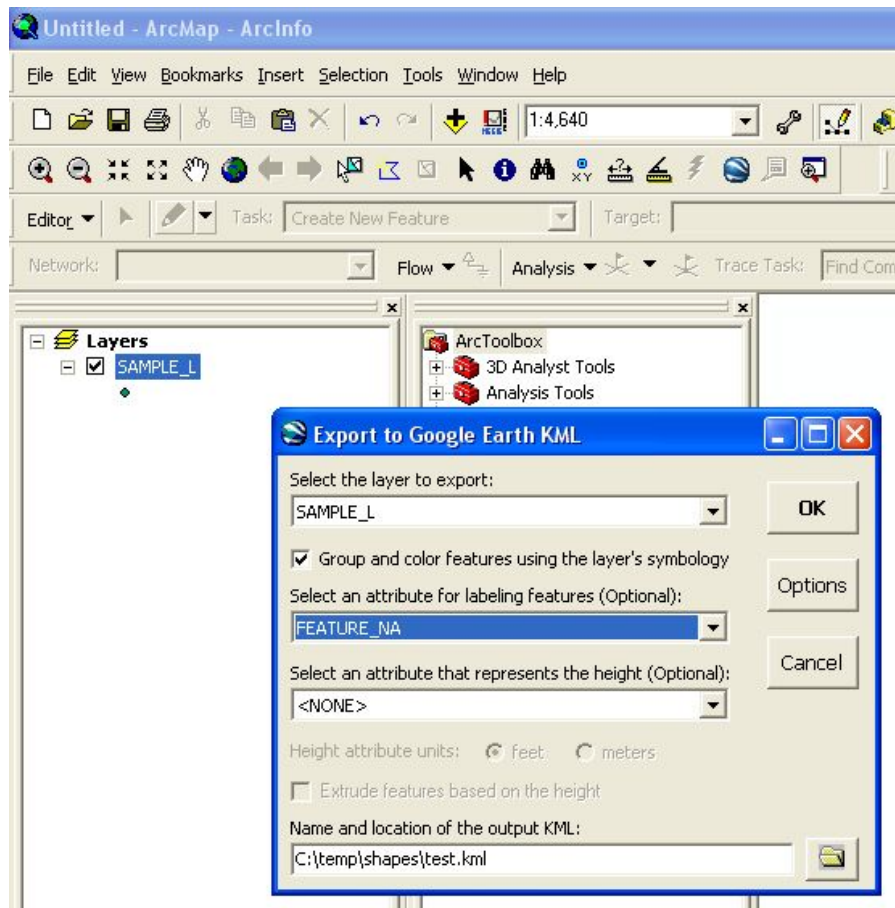
- Getting your own organization's data into Google Earth is a very important first task for most Google Earth users.
- Most GIS software now has an 'Export to KML' function - some are better than others - but all of them are getting better at each release because of the popularity of KML
- Many Add-Ons available for free or low cost
  - [Arc2Earth](#)
  - ArcScripts - [Export to KML](#) - City of Portland, OR
  - Zonums - [Shp2KML](#)
- It is possible to digitize point, line and polygon features directly in Google Earth and is a good way to get your data in for small scale projects.
- GPS data can now be loaded directly into the free version of Google Earth.
- You may come to find that most of "your" data is already available for use in Google Earth search the web first before going through the effort to create your own KML.

### DEMO

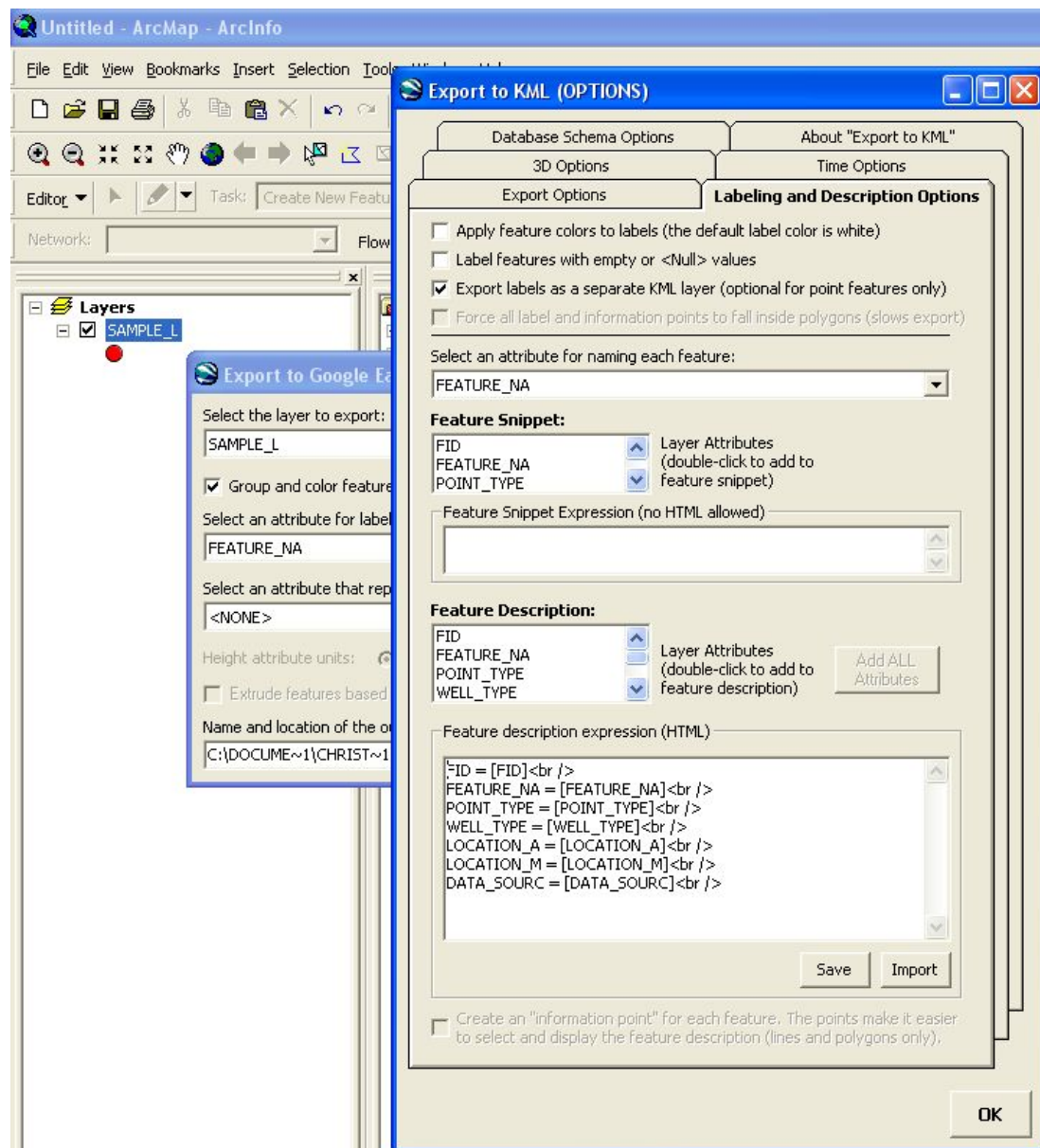
- Start ArcMap and make sure the ArcScripts tool is installed.
- If not you will need to install it.
  - Right-click on any toolbar
  - Select Customize from the bottom of the list.
  - Go to the Commands tab and select Add from File.
  - Select the ExporttoKML.dll file
  - Select the Toolbars tab and turn on Export to KML.
- Open a point shapefile that you would like to work with or [download](#) sample data from the DEP Training site. We will use the SAMPLE\_L.shp file for the demo.
- First, let's just export the layer with the default settings. And launch it in Google Earth to verify the output.



- Next, export the layer with the attribute for labeling set to FEATURE\_NA. Now in Google Earth you will labels drawing.



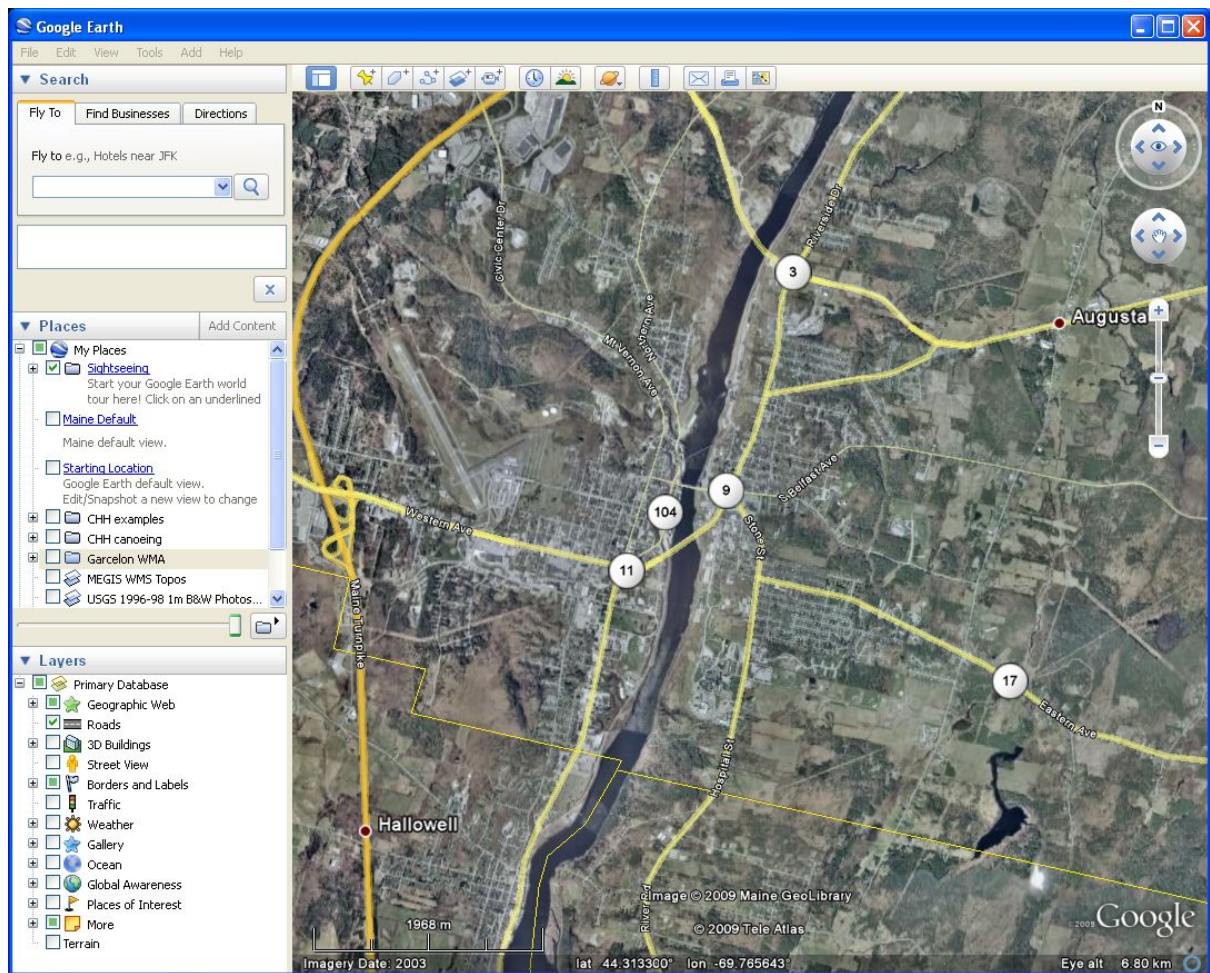
- In ArcMap, change the symbology of the point feature.
- Try exporting the layer again, but this time select Options and set up the Labelling and Description Options so that the attribute data shows up in the balloon in Google Earth.



- Continue to experiment with the export Options so that the data and symbology matches what you would like to see.

## Using Google Earth to Build a Project:

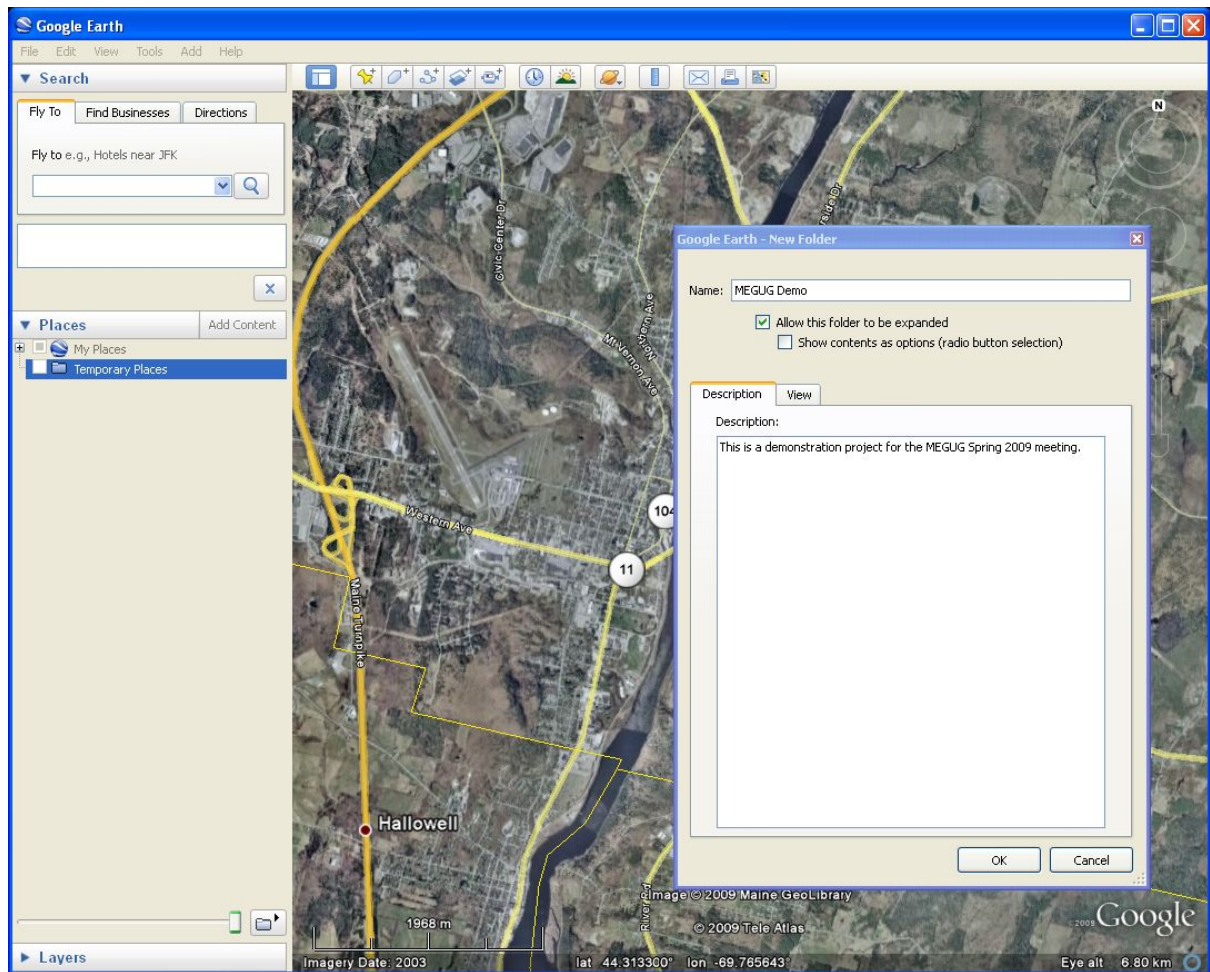
Google Earth will start with the left hand Search, Places and Layers sections looking something like this:



- It will decrease confusion and add additional space to work in to turn off many of the Google Content layers that you won't need in the Layers section and to minimize that section.
- It is also good to minimize the MyPlaces heading under the Places section.

### To start building a new project:

- Highlight the Temporary Places folder
- Select Add...Folder from the main menu.



- Enter the name of the project
- In the Description section type a brief overview of the project.
- Click OK.

### Saving the Google Earth project

- To save a project to your local machine in a KML file, right-click on the new MEGUG Demo folder in the Places section and select Save Place As.
- For right now, save it in the KML format.
- KMZ is also a valid format so let's explore that further.

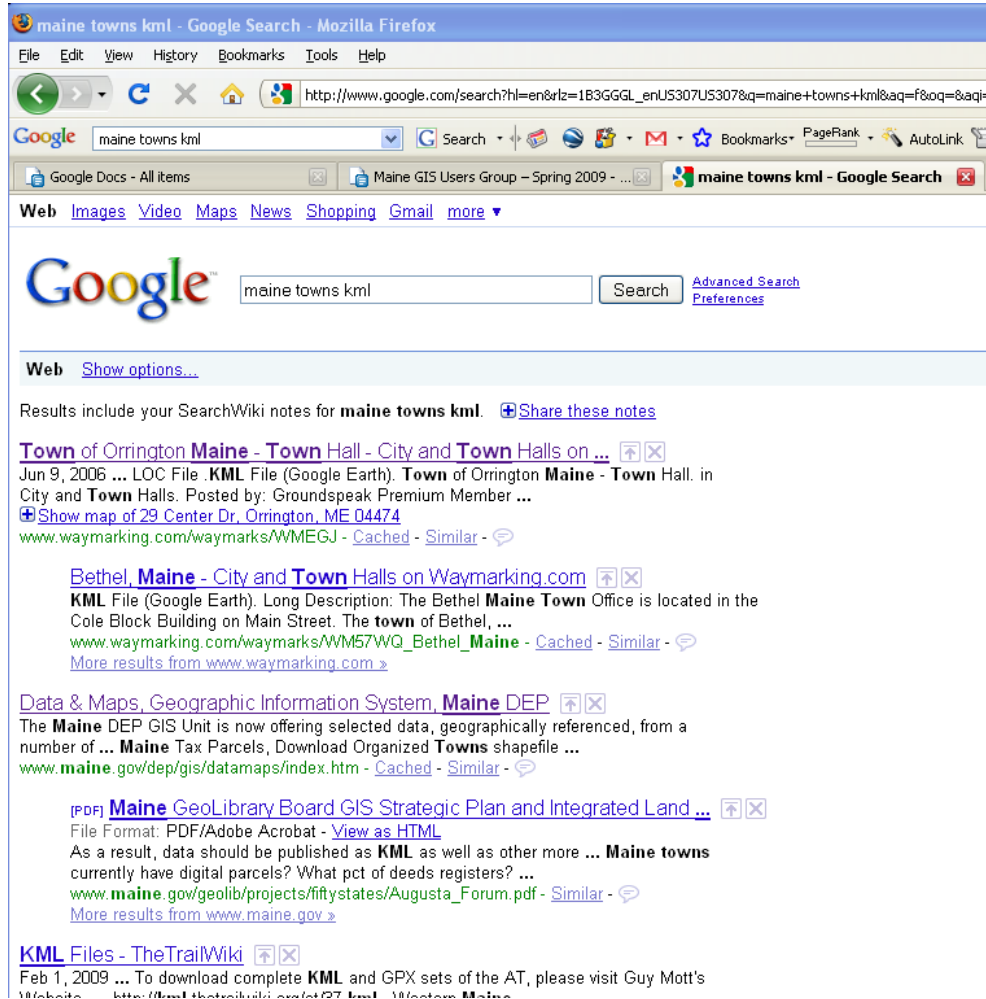
### What is the difference between a KML and KMZ file?

- KMZ is just a compressed version of a KML
- KML files are XML-based and thus can be very large
- The large size will mean slow transfer speeds over the web
- You can "unzip" a KML with a tool like WinZip
- You can also put reference files like icons, photos, data files in a KMZ so that the whole "package" can be transferred to a user in one file.

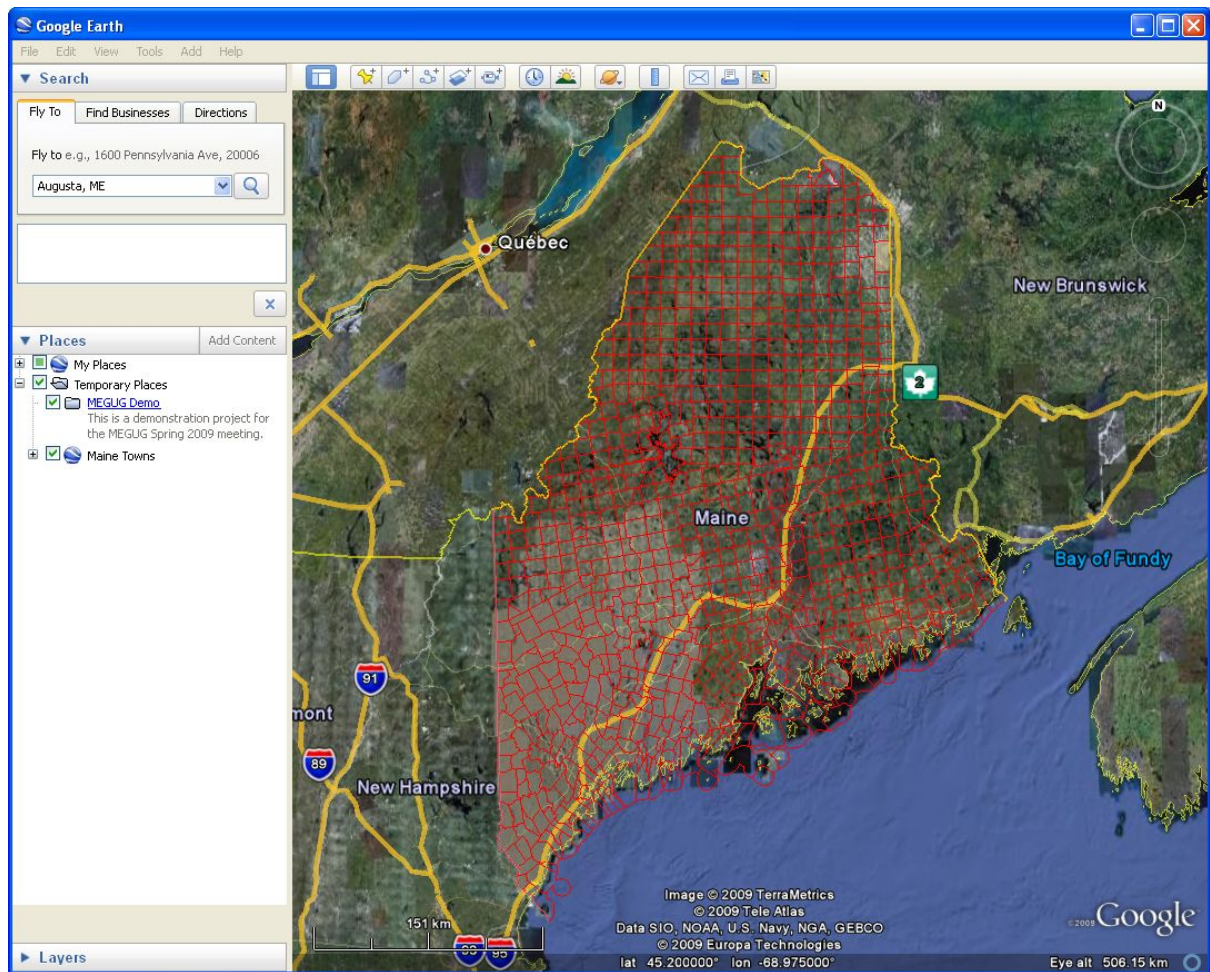
### Finding Data

- There is very little data creation that has to be done now with the popularity of web mapping.

- Use a simple Google Search to find available data layers in KML format on the web
- Remember that the sincerest form of flattery is imitation.
- For example, in the MEGUG Demo project I want to have a layer showing Maine town lines.
- Search the web for "maine towns KML"



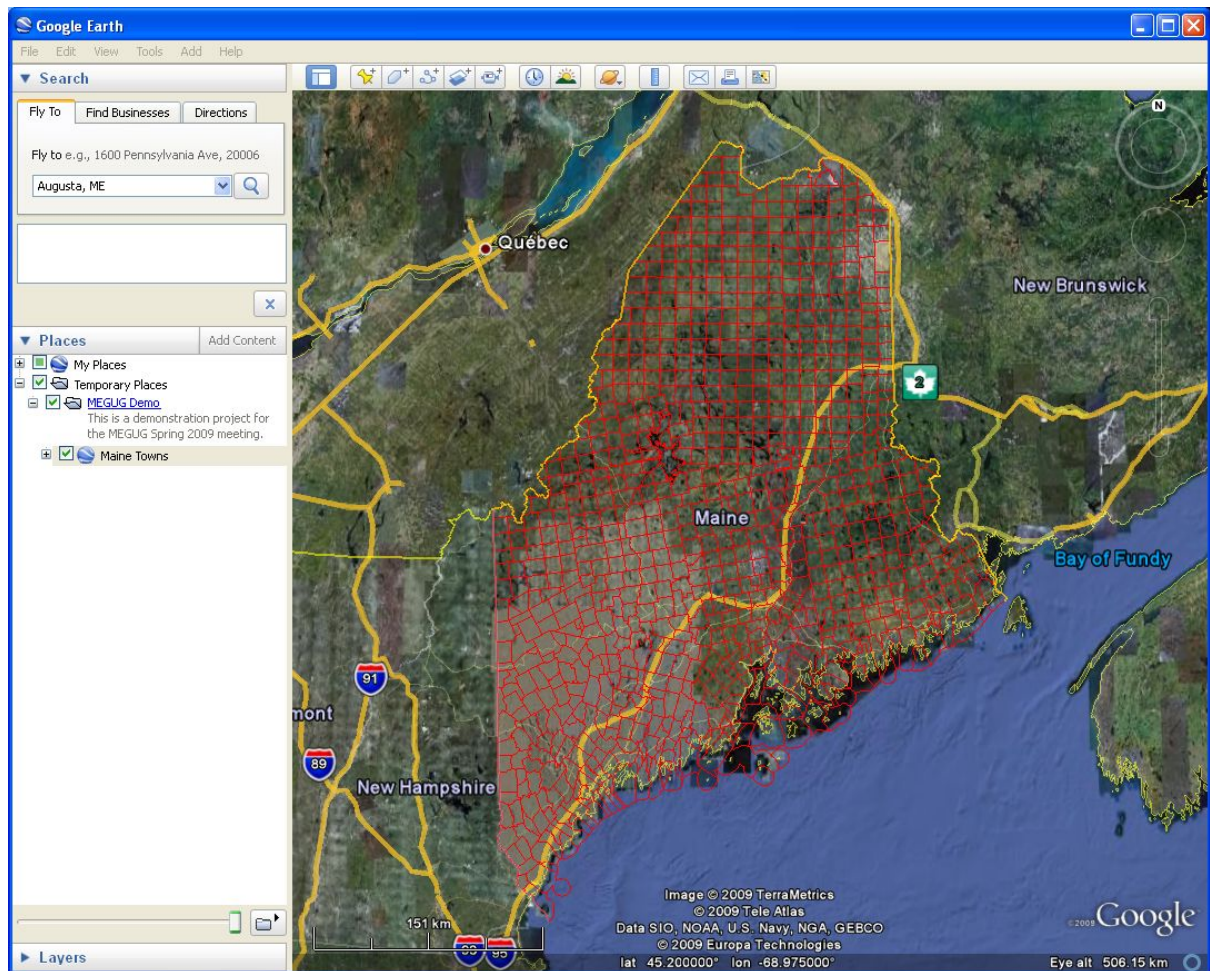
- Click the Data & Maps link at Maine DEP
- Scroll down until you find the Maine Towns KML and click on it. This will launch the Maine Towns layer in Google Earth.



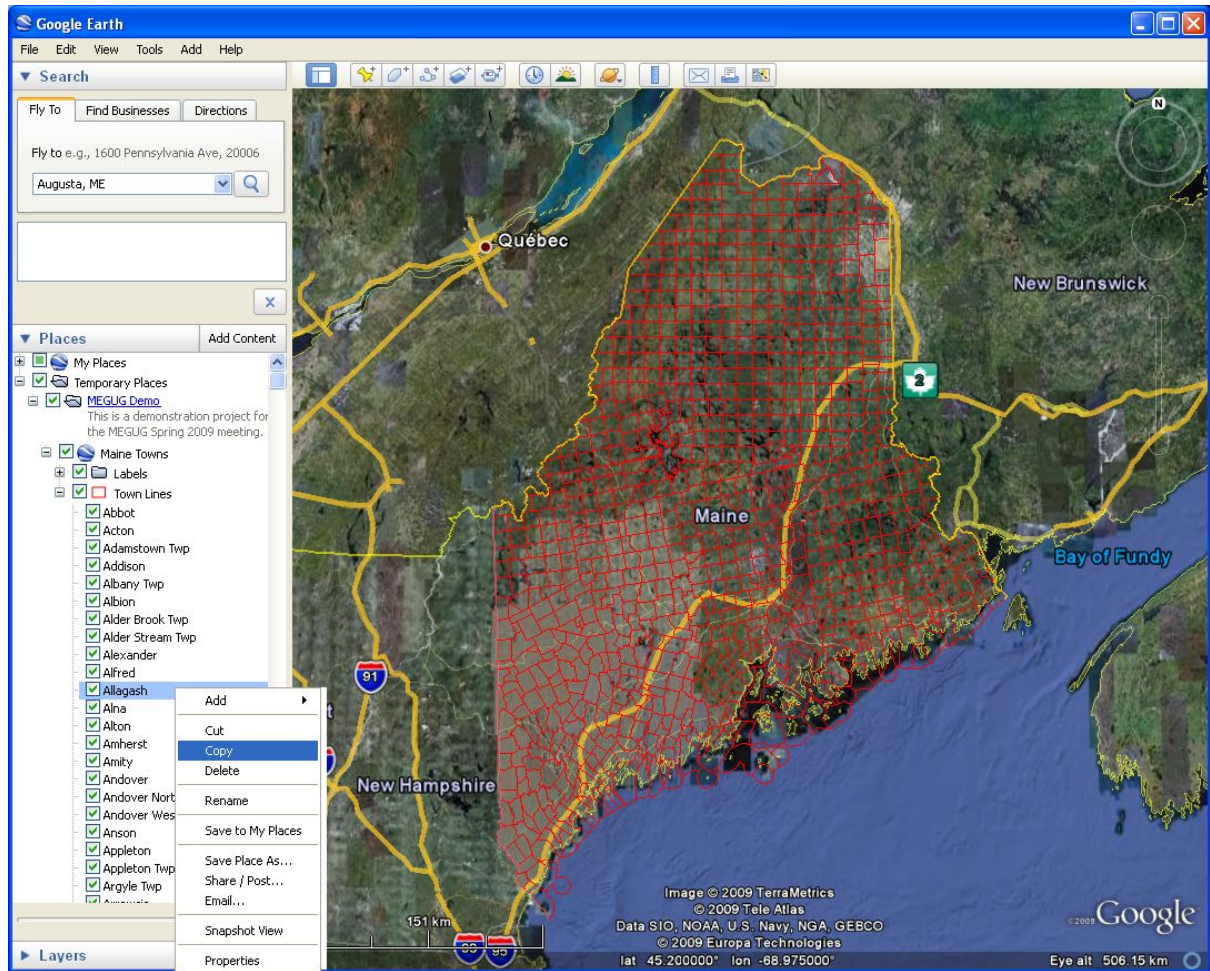
- There is no need to create your own towns layer since someone else has already done it.
- Try a few web searches to see how successful you can be finding data that pertains to your project.

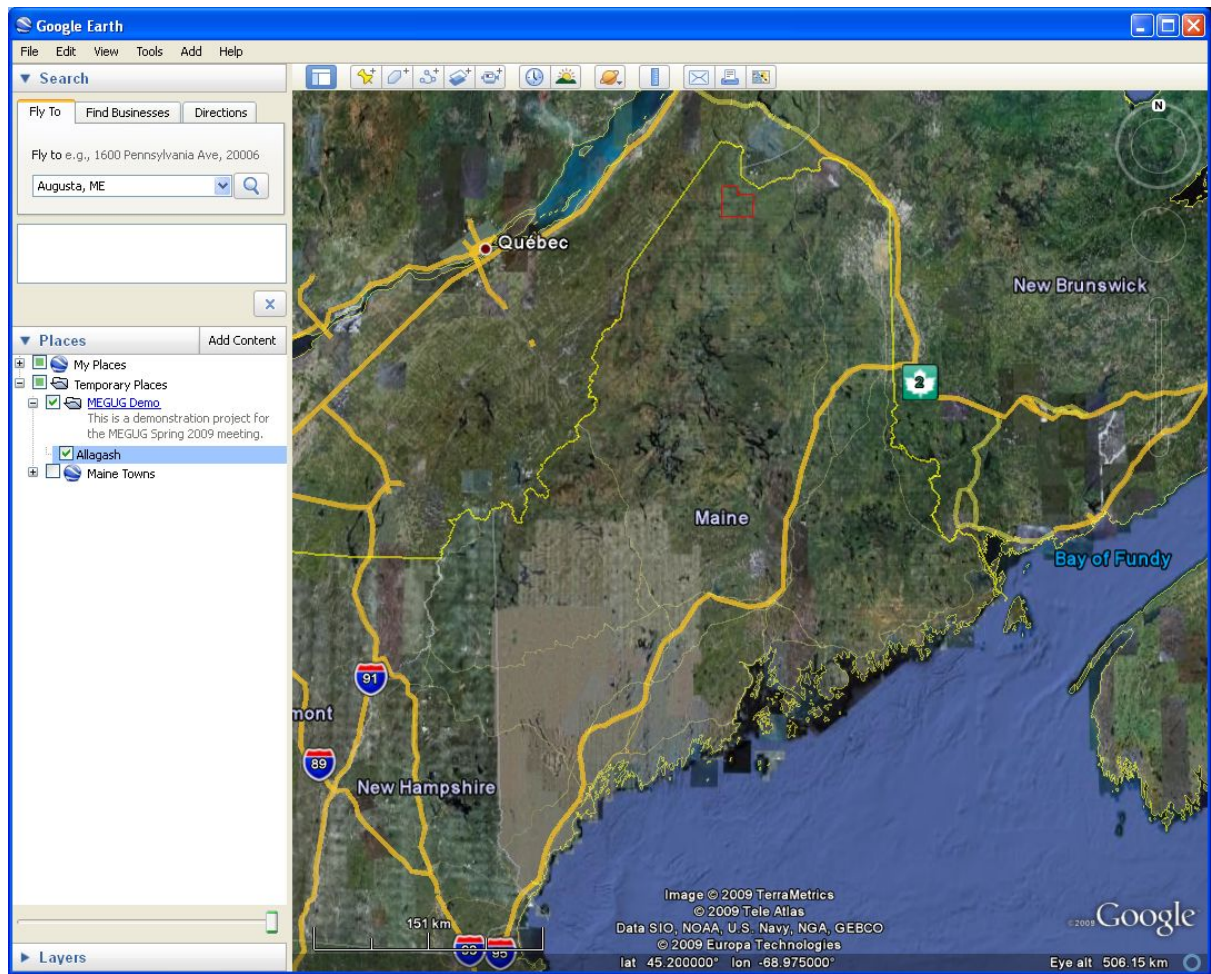
## Copying Data

- Now that we've found the Maine Towns layer lets incorporate it into the MEGUG project.
- The easiest way is to drag and drop the whole layer in the Places section into the MEGUG Demo folder.



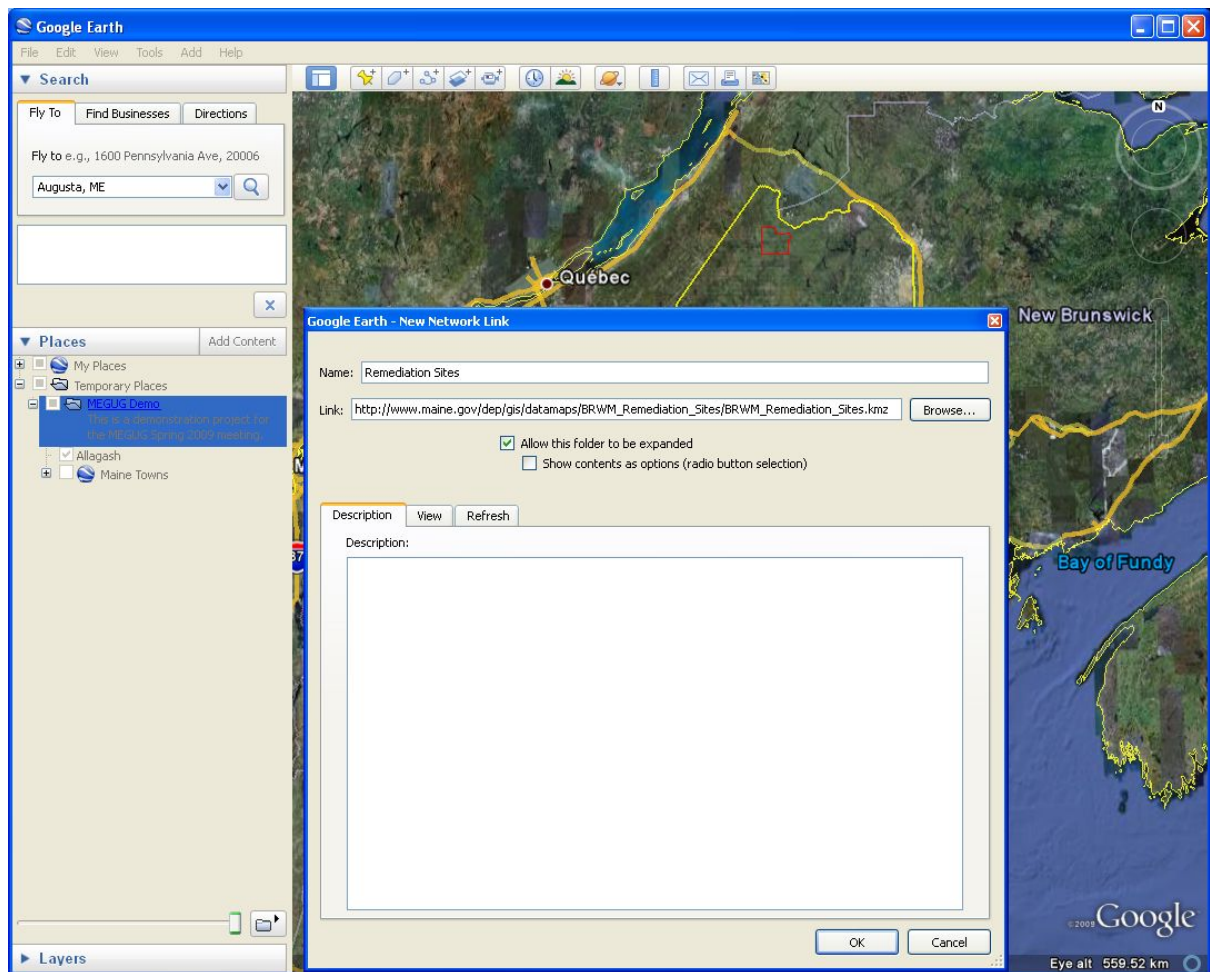
- It is also possible to select just one or a few features and copy those into the MEGUG folder if the whole layer isn't needed.
- Here the copy...paste method is demonstrated by right-clicking on the individual town to copy it from the Towns layer and then right-clicking on the MEGUG folder and pasting it.

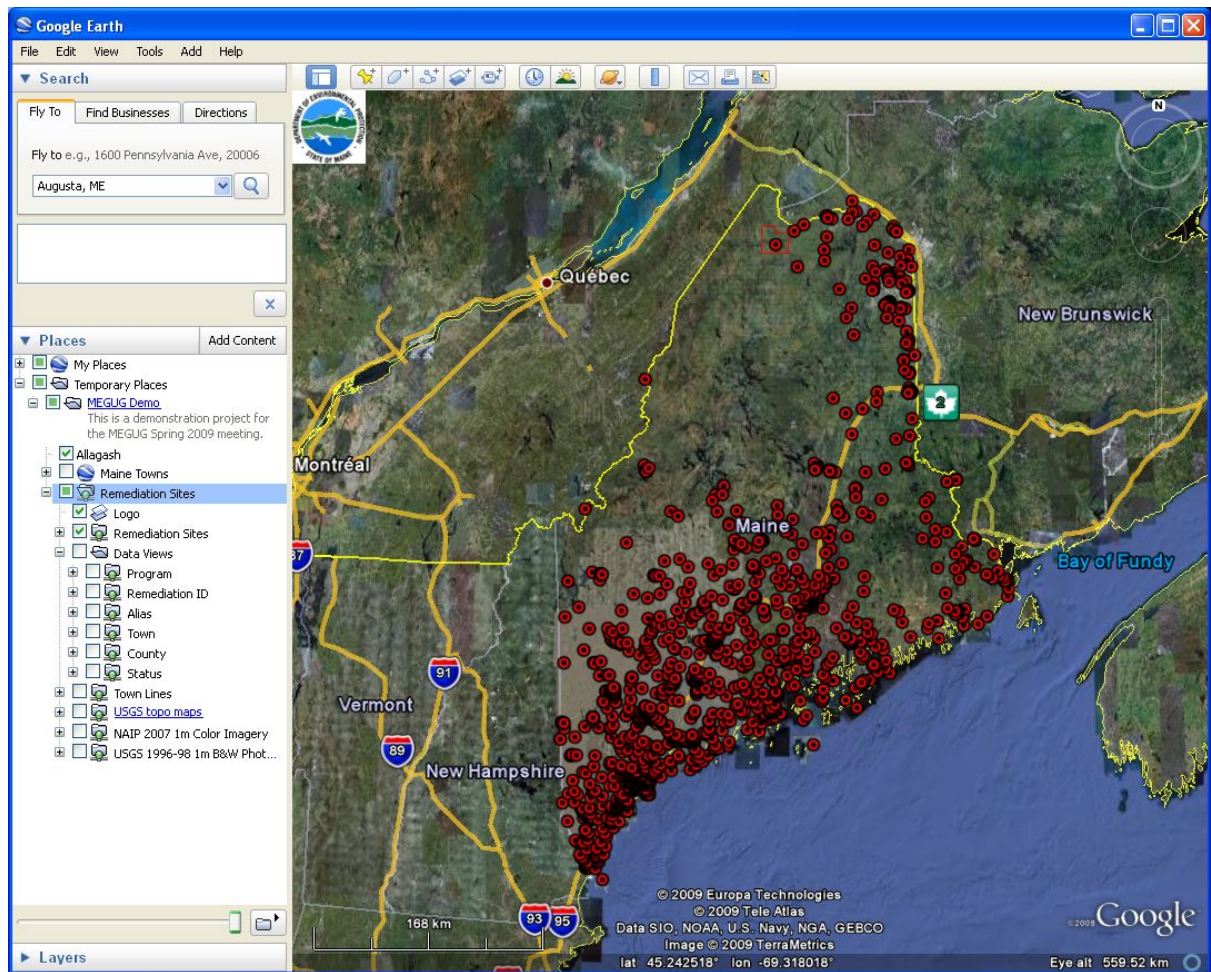




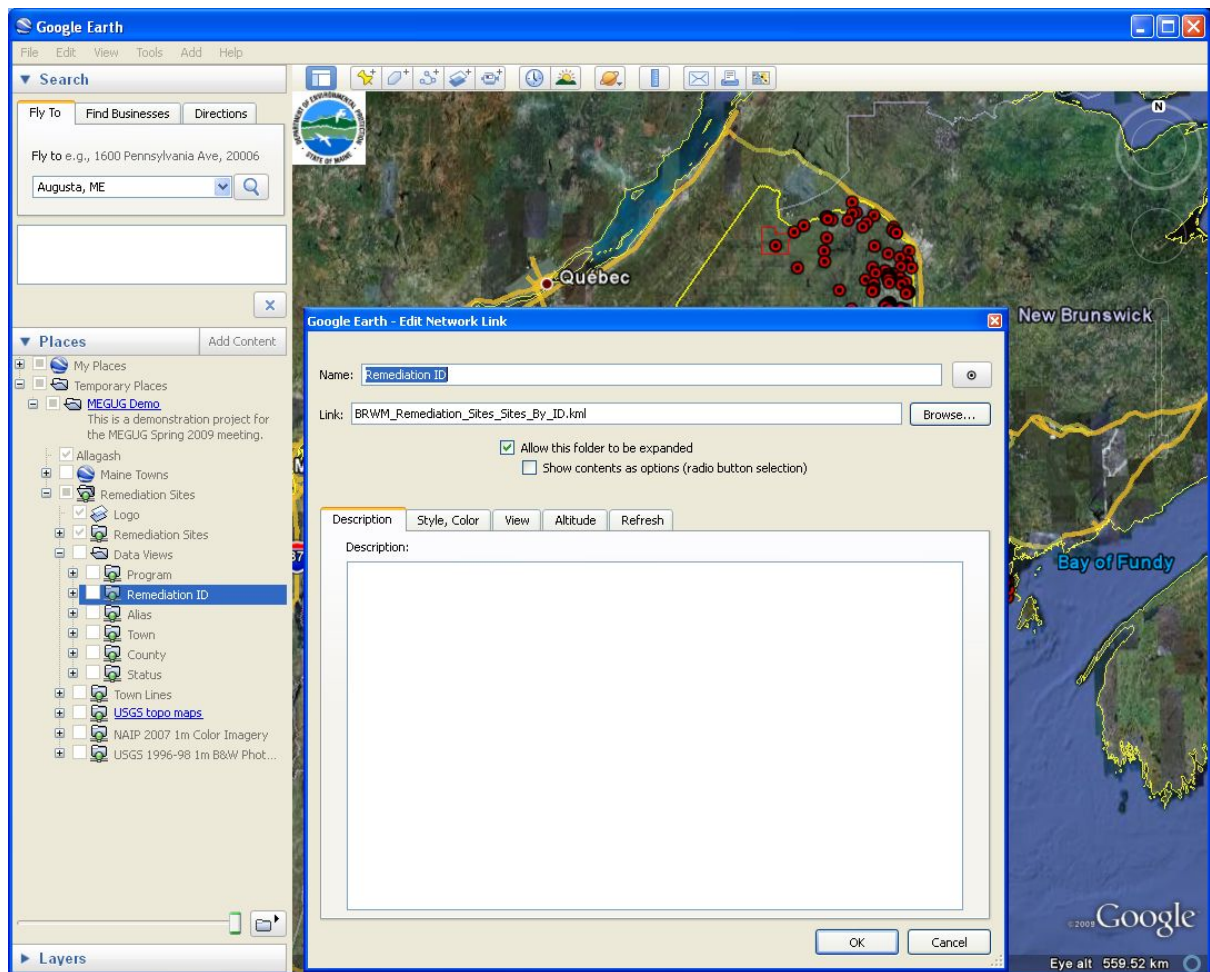
## Network Link to other KMLs

- Copying data is fine if the data itself never changes.
- But if you want to use a layer and make sure you get any updates whenever the layer is changed by the owner then Network Links should be used.
- Below is an example showing how to add a link to a whole Google Earth project.
- First find a KML/KMZ file on a web page that you want to load into your project.  
I have selected the Remediation Sites ([http://www.maine.gov/dep/gis/datamaps/BRWM\\_Remediation\\_Sites/BRWM\\_Remediation\\_Sites.kmz](http://www.maine.gov/dep/gis/datamaps/BRWM_Remediation_Sites/BRWM_Remediation_Sites.kmz)) project on the Maine DEP Data & Maps web page.
- Right-click on the link and select "Copy Link location".
- In Google Earth, to add a Network Link click Add...Network Link from the menu.
- Type the link Name and paste in the URL to the Link field you copied from the web page.

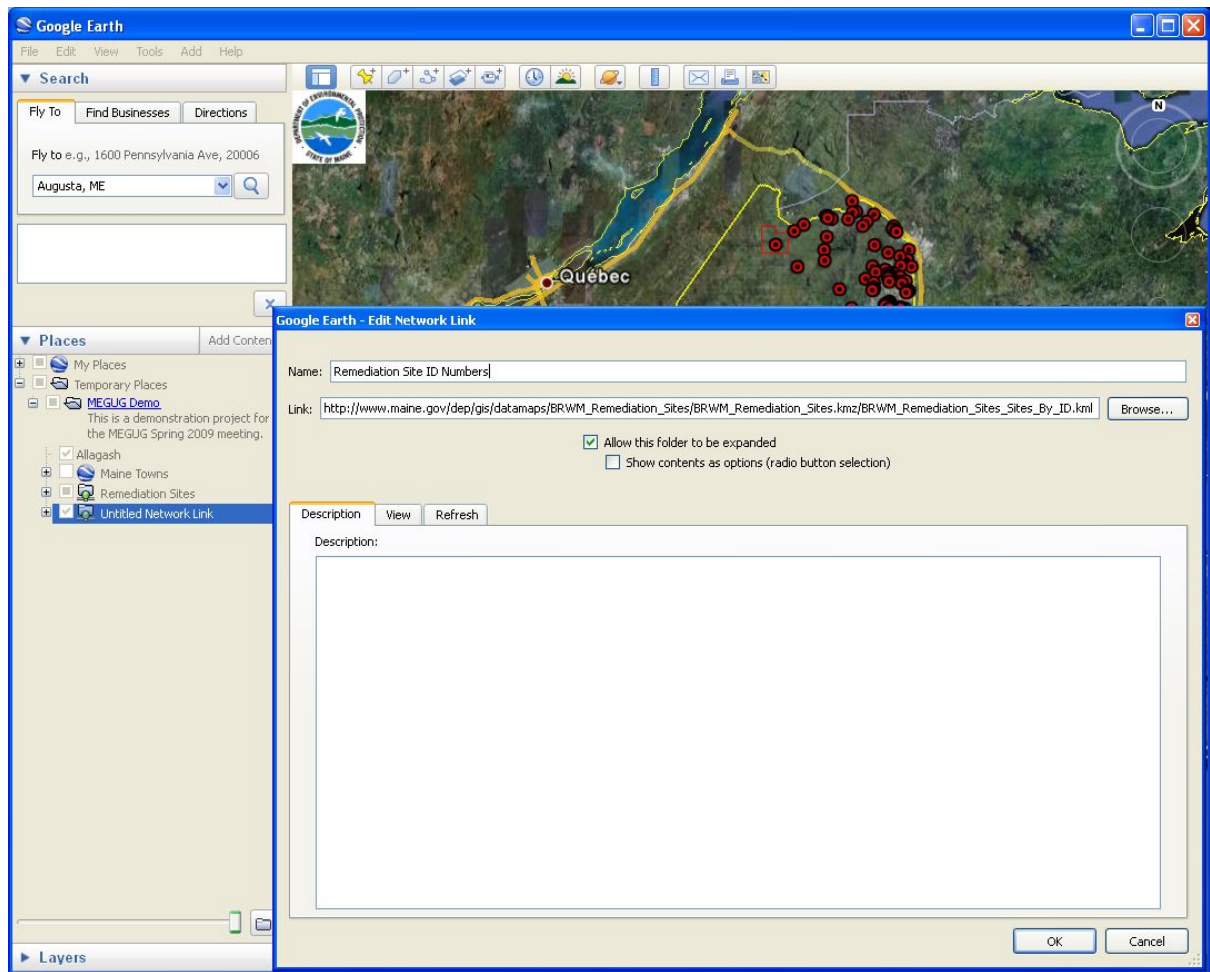




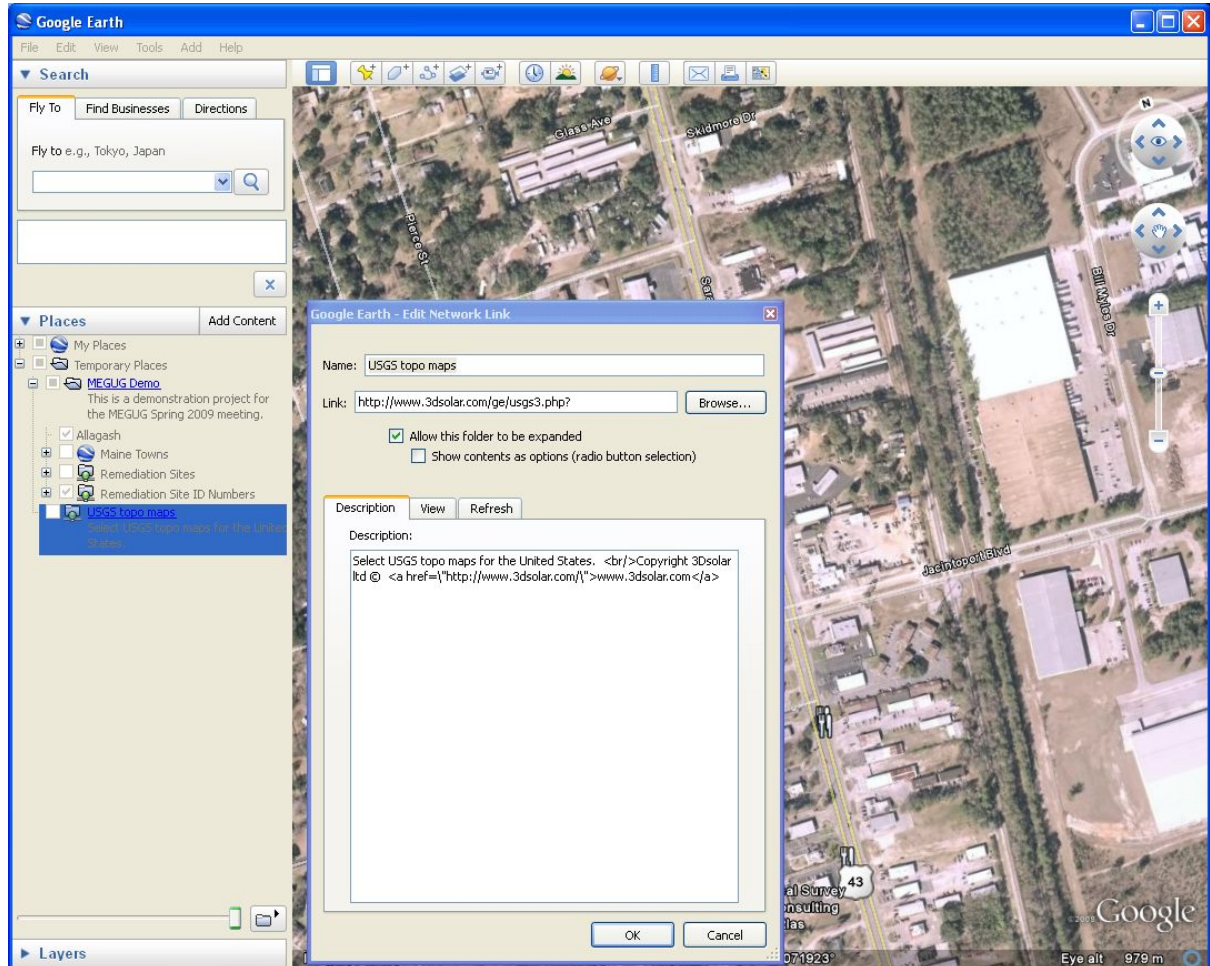
- Here again you may want to use only a single layer from the Remediation Sites project.
- For instance, if you wanted only the Remediation ID layer you can right-click and select Properties for that layer.



- The Link box shows only a path to a single KML. Since we know the Remediation Sites project is a KMZ and this KML is a relative link we will have to combine the two addresses in the new Network Link. This is an example of a nested KML within a KMZ.



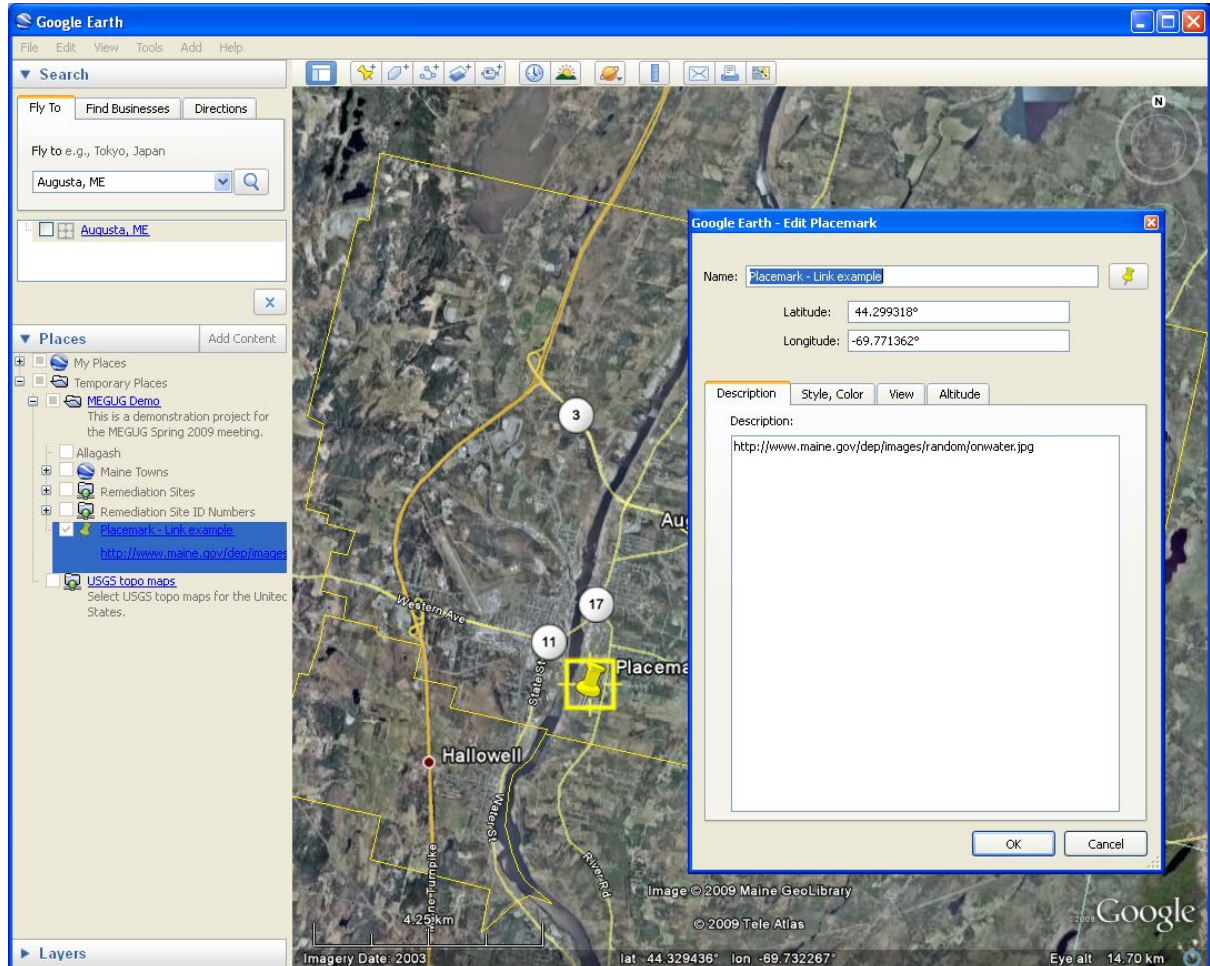
- Network Links don't always have to be to just other KML/KMZ files.
- They can link to scripts and other types of web-based layers.
- Find the USGS Topographic Maps layer on the Maine DEP Data & Maps web page.
- Click on it to open it in Google Earth.
- Right-click on the layer to open the Properties dialog box.



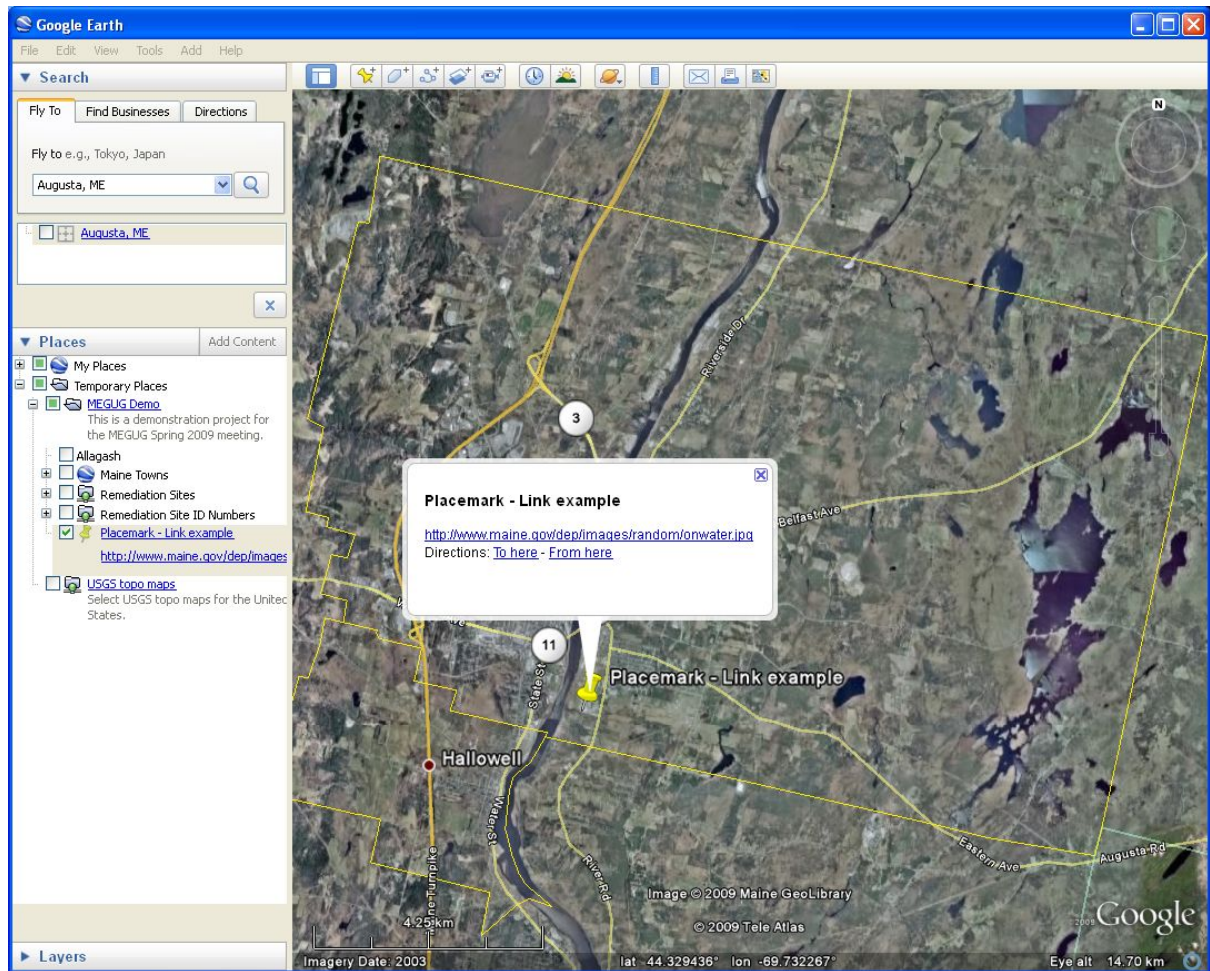
- Notice that the url doesn't point to a KML/KMZ. It is pointing to a php script, on yet another web server, that will take care of sending scale dependant images of the topo quads to the current Google Earth view extent.

## Links to other photo, pdf, and data files

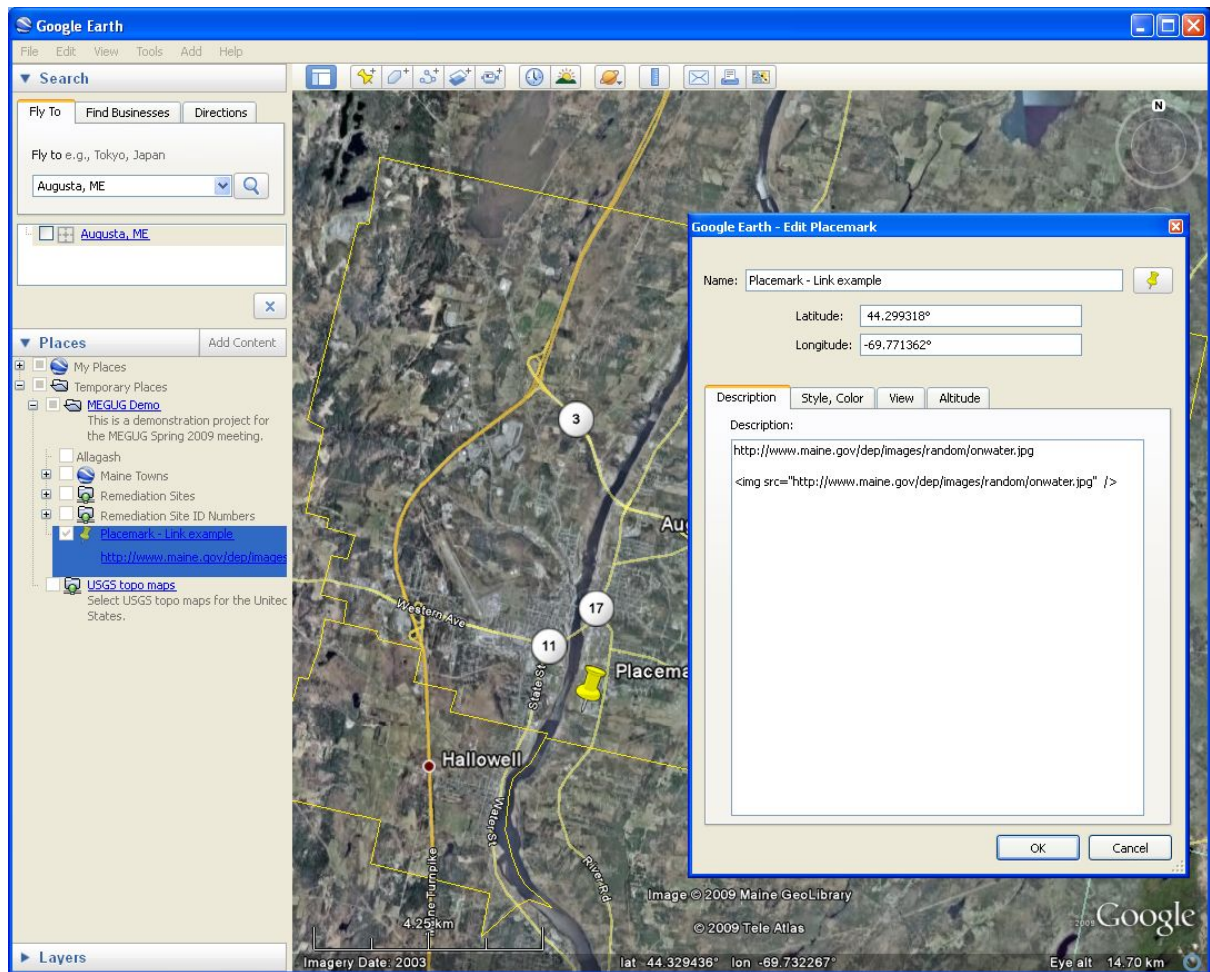
- From a Google Earth feature the Description tab, which determines what shows up in the balloon, can be used with HTML to link to any other photo, pdf, Word, Excel file, etc. available on the web.
- Create a new Placemark and let's copy a random url for an image off of a web page into the Description.

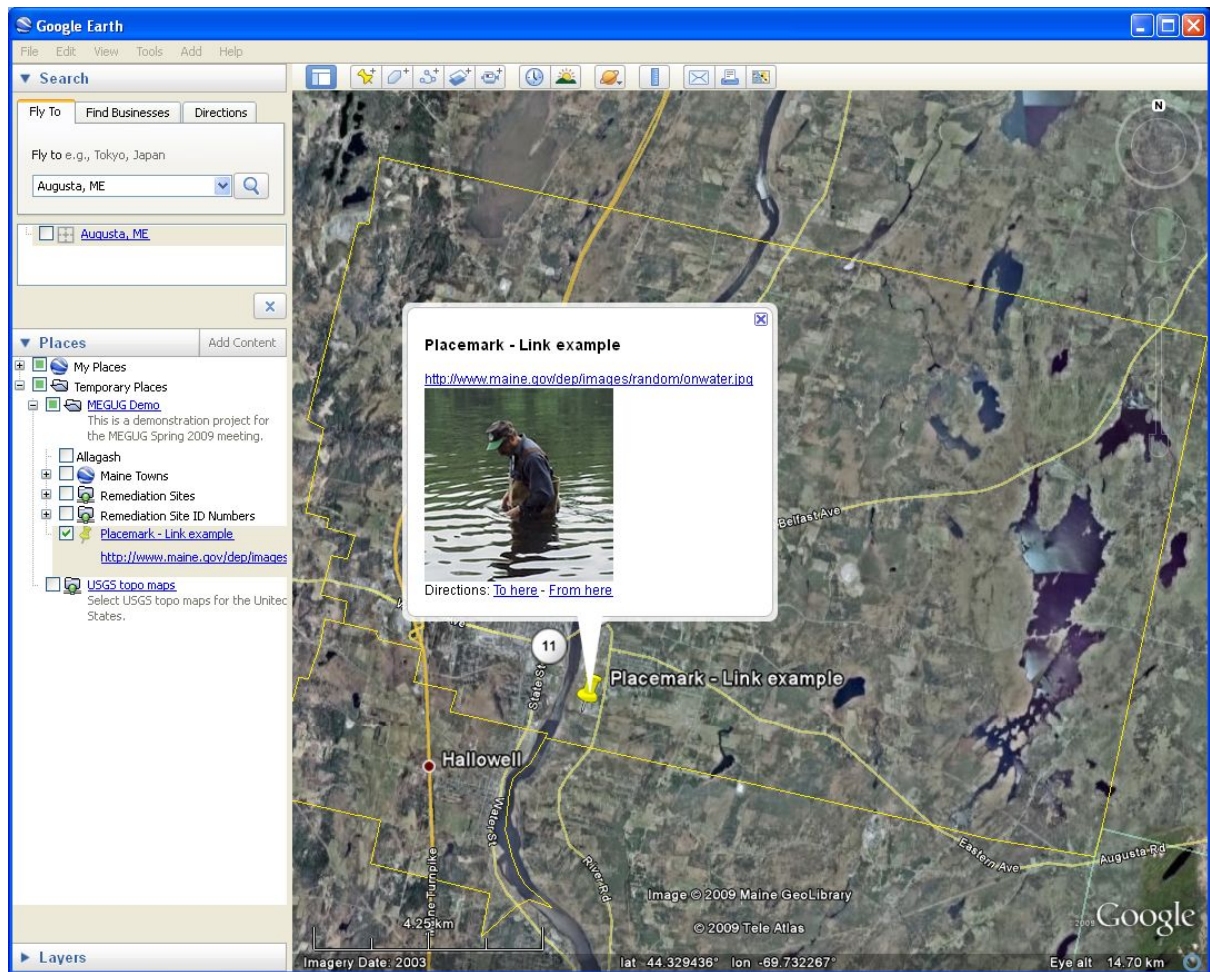


- After clicking OK, you will be able to click on the point on the map and then follow the link to view the picture in a external web browser.

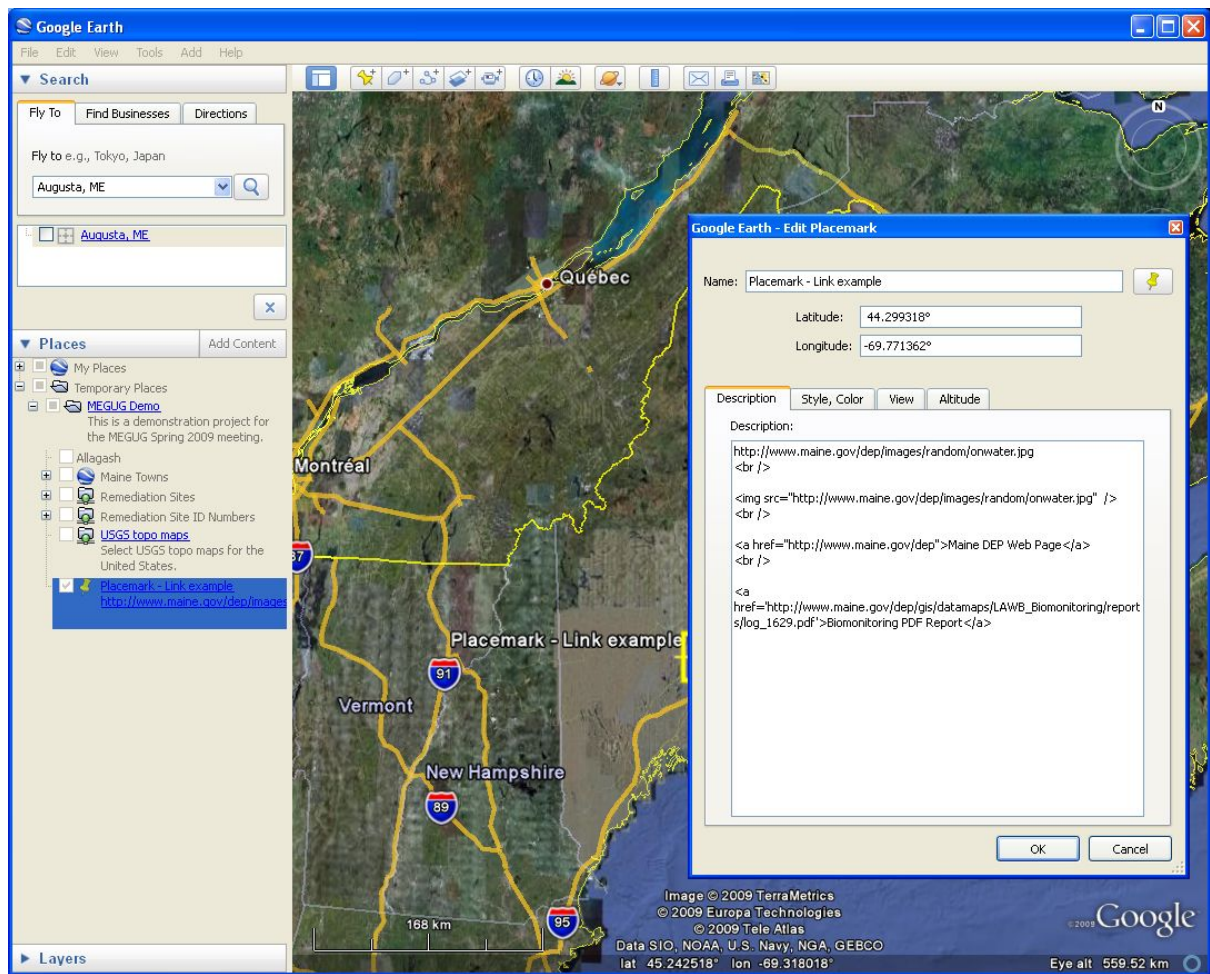


- If you would like to display the picture right in the Google Earth balloon you can use HTML to do that.
- A great resource for learning simple HTML is [W3Schools](http://www.w3schools.com).



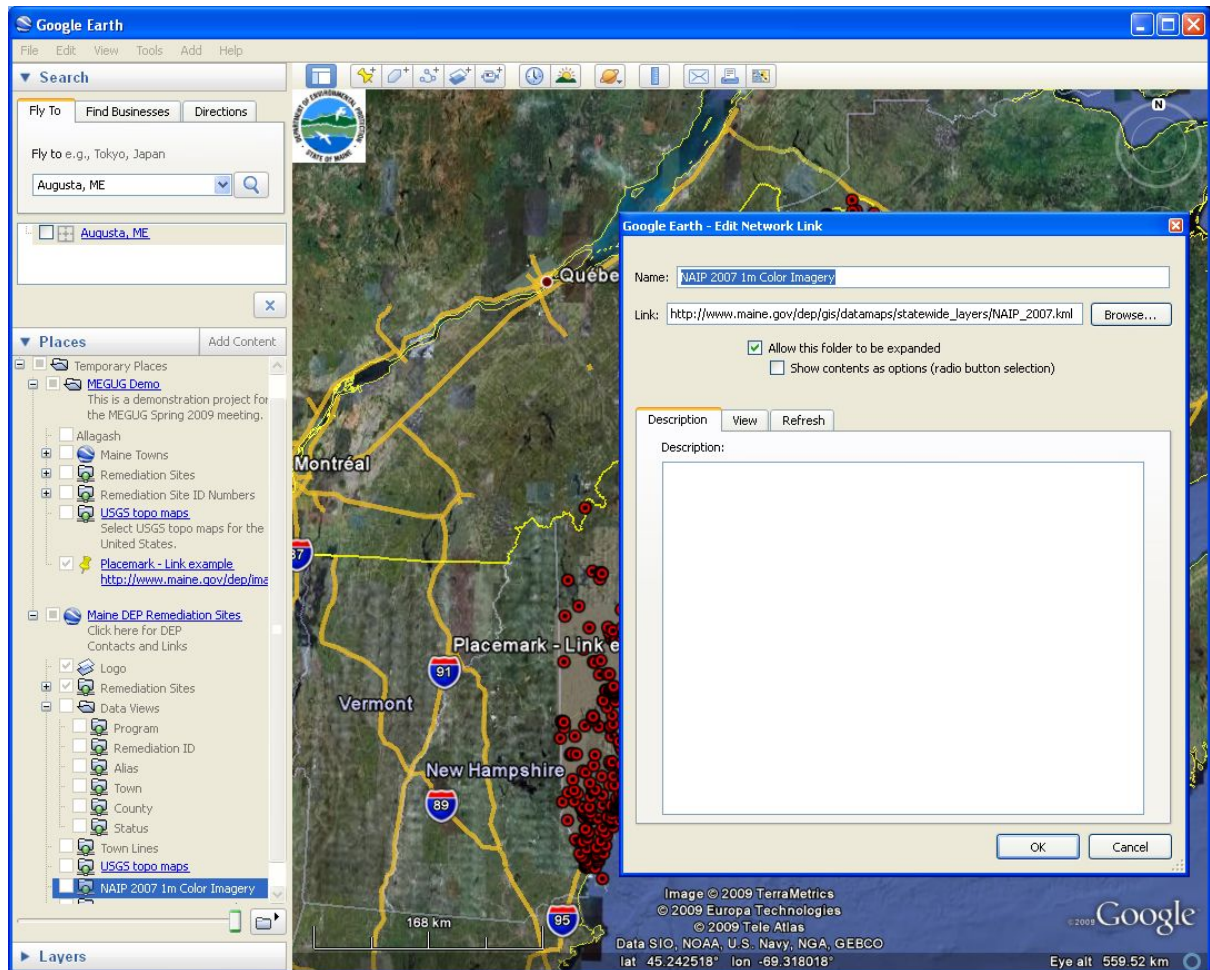


- Links can also be created to point to other web pages and files like pdf reports.

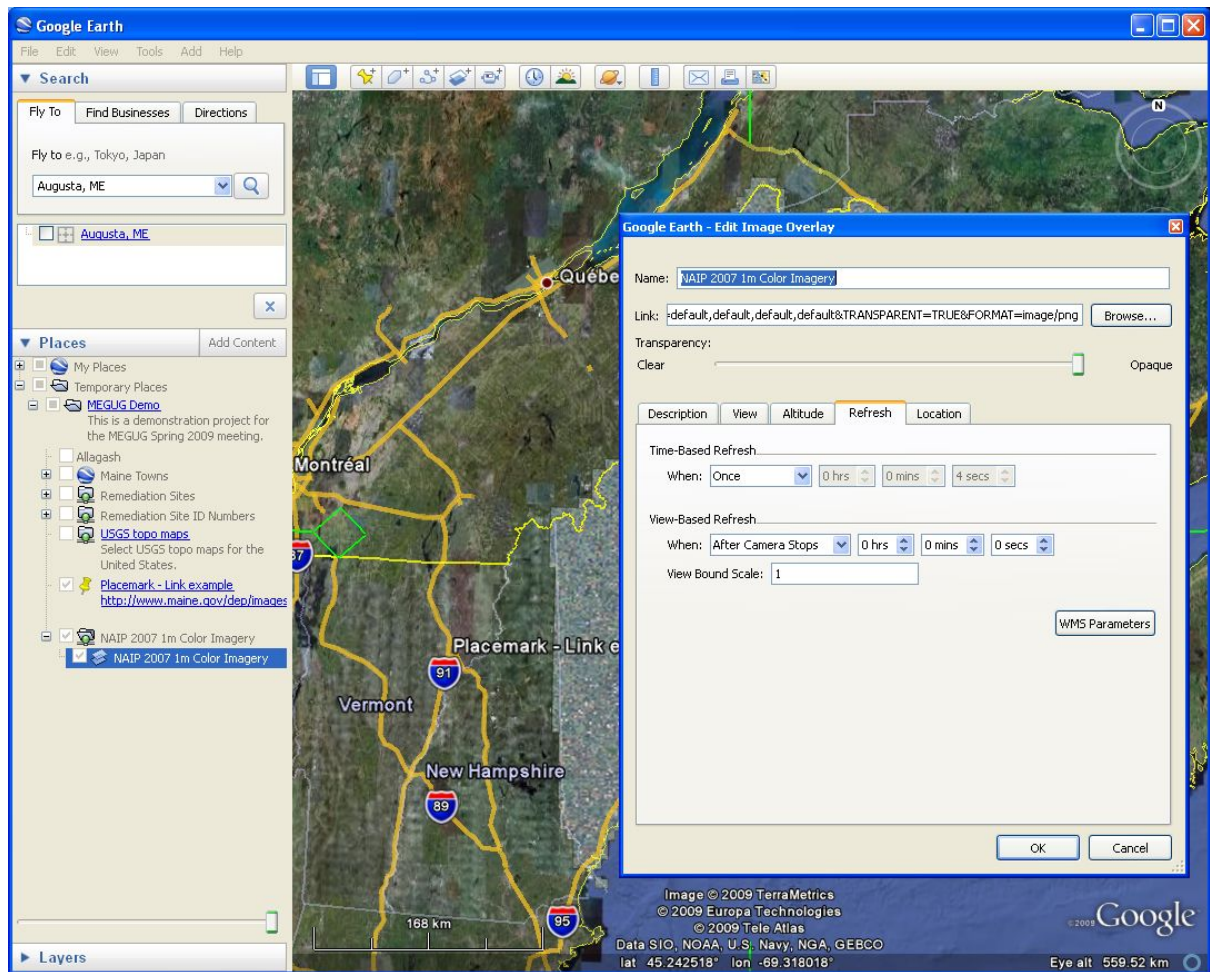


## WMS Services

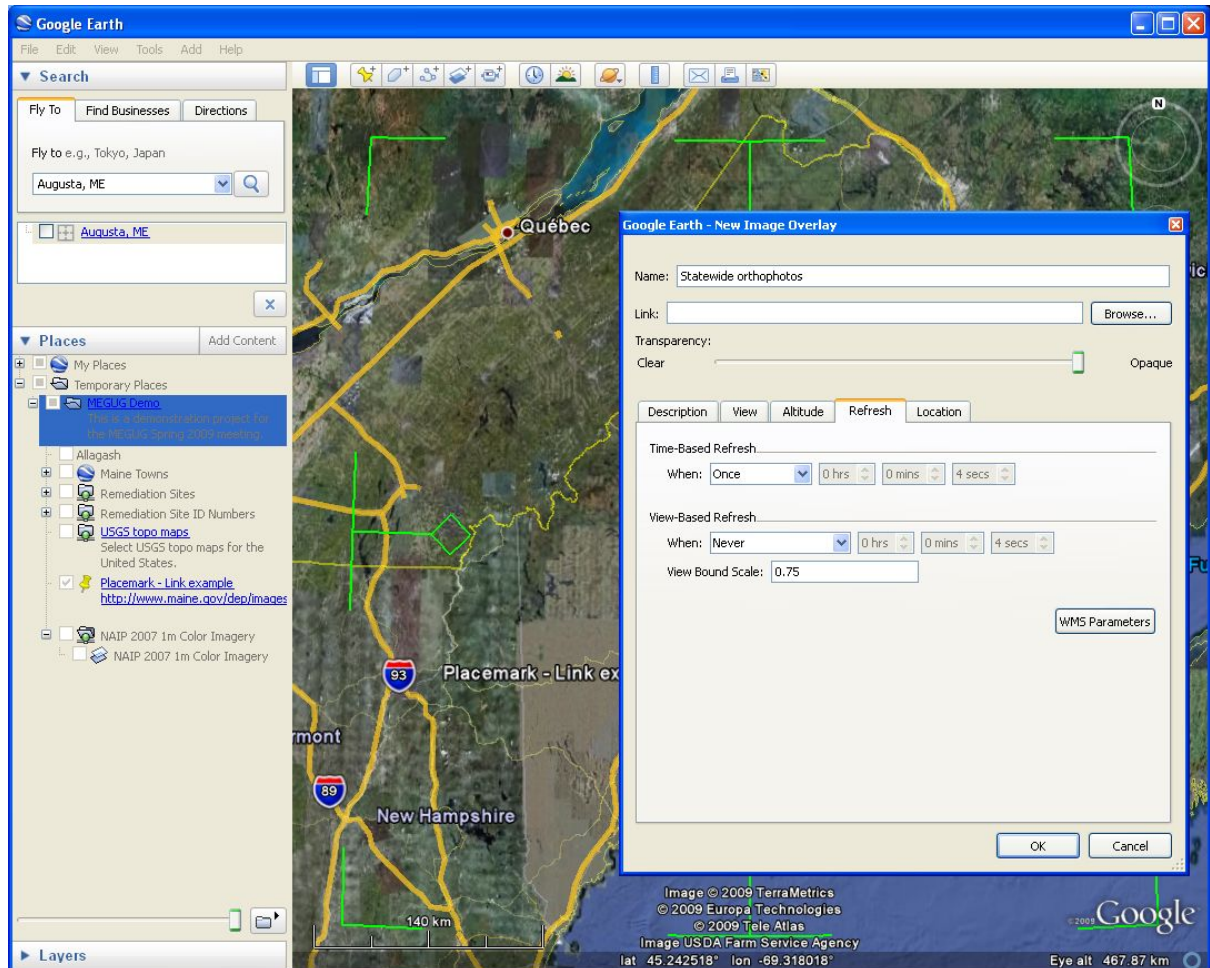
- Web Mapping Services (WMS) are services deployed by many different organizations today that can be used by different web mapping clients, like Google Earth, Microsoft Virtual Earth, NASA World Wide or desktop mapping tools like ArcMap, ArcExplorer, MapInfo, and open source GIS like QGIS.
- Here again you can copy a WMS from another project you already have loaded or search the web for one.
- Here is an example of a WMS served as a Network Link. Here we can put this into the MEGUG Demo project just like any other link by copying and pasting or dragging and dropping.



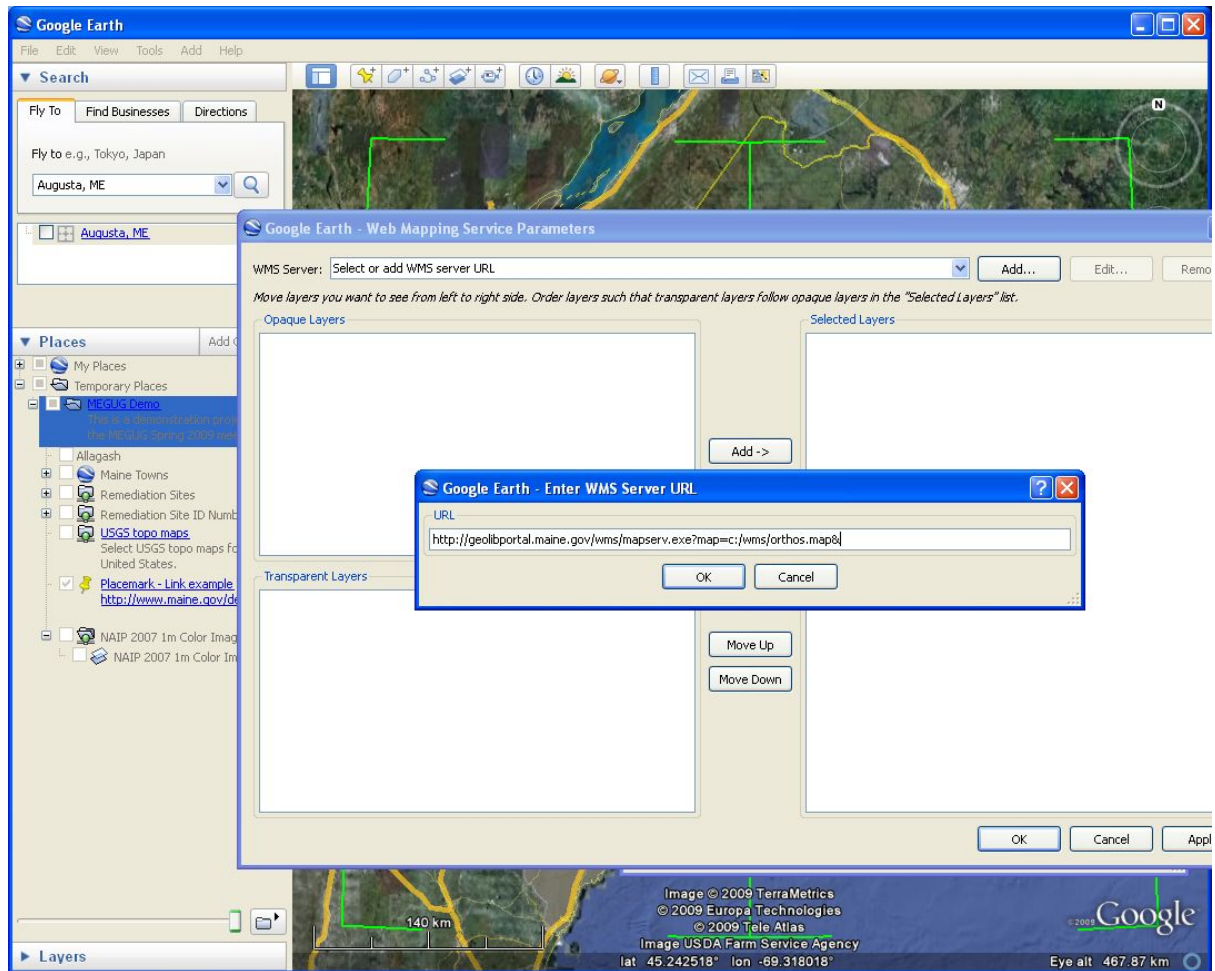
- Here is a look at the actual WMS settings. These are typically delivered using the Image Overlay feature in Google Earth. You can see a very long url has been created.



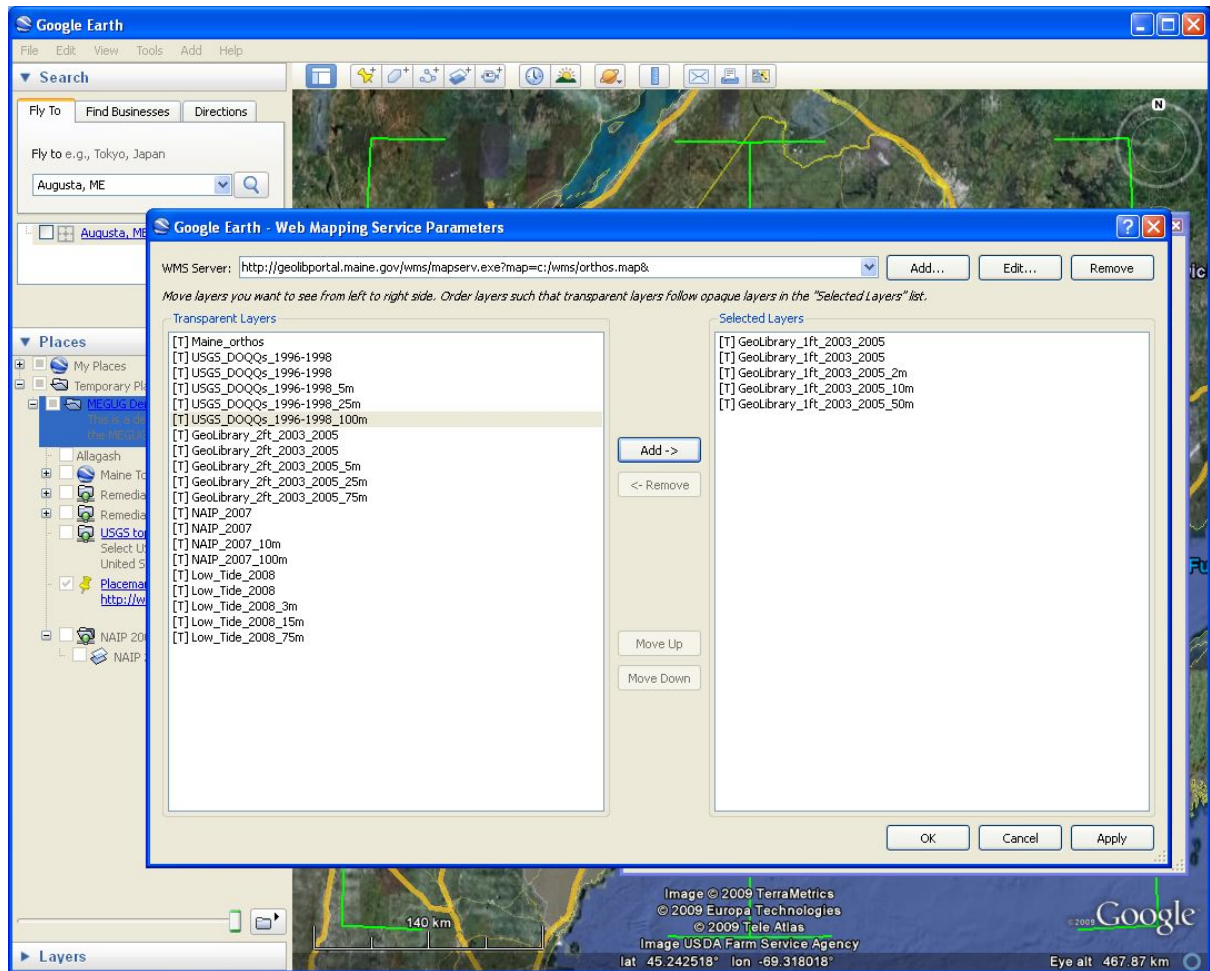
- More likely you will come across a web page with a WMS url to point to.
- Check out the [MEGIS/Maine GeoLibrary WMS](#) web page for an example. Let's use the Maine statewide orthophotos here to build an overlay with WMS in Google Earth.
- Copy the url from the web page.
- In Google Earth, select the MEGUG Demo project, right-click and select Add...Image Overlay.
- Give it a name
- Click the Refresh tab and select WMS Parameters



- Click the Add button on the Web Mapping Service Parameters and copy in the url from the web page

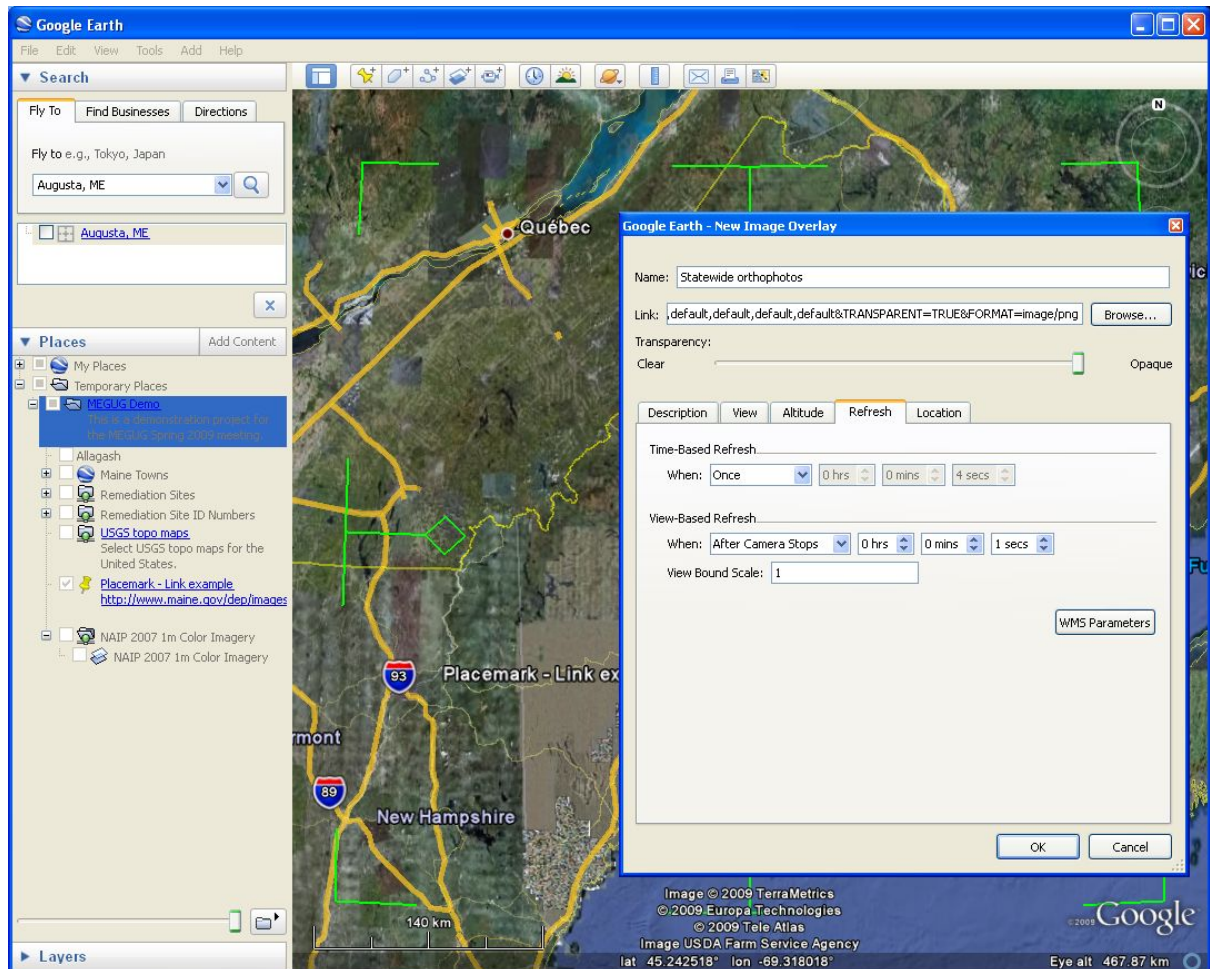


- Next, select the photo layers from the left side that you wish to utilize in your project.



- Select OK

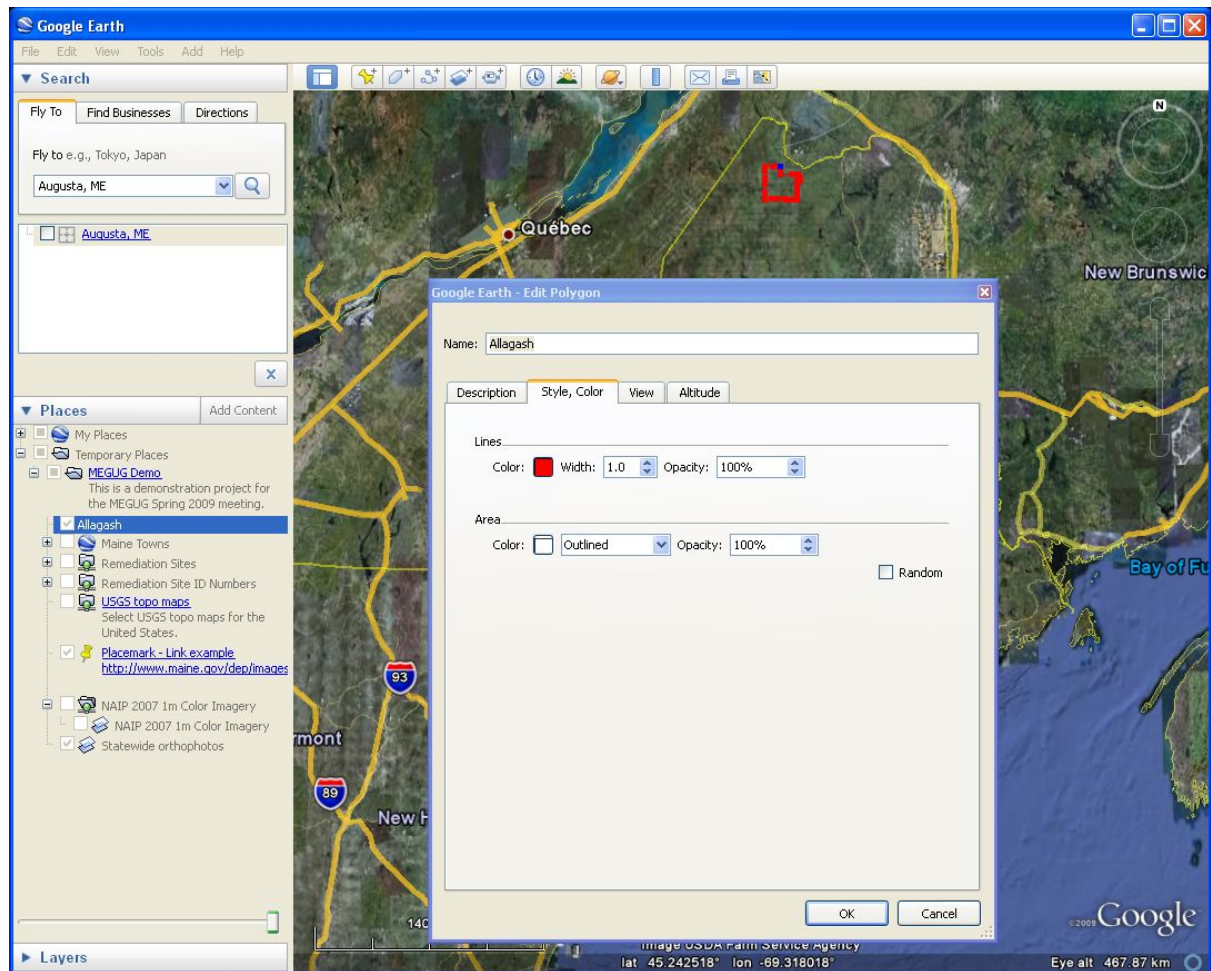
- Back on the New Image Overlay screen I usually change a couple of the View-Based Refresh options. When = 1sec and View Bound Scale = 1. This tells Google Earth to get a new image from the WMS 1 second after zooming to a new location and to fill the view with the image. A View Bound Scale setting of 0.75 would draw the image over 75% of the screen leaving a border around the outer 25%.



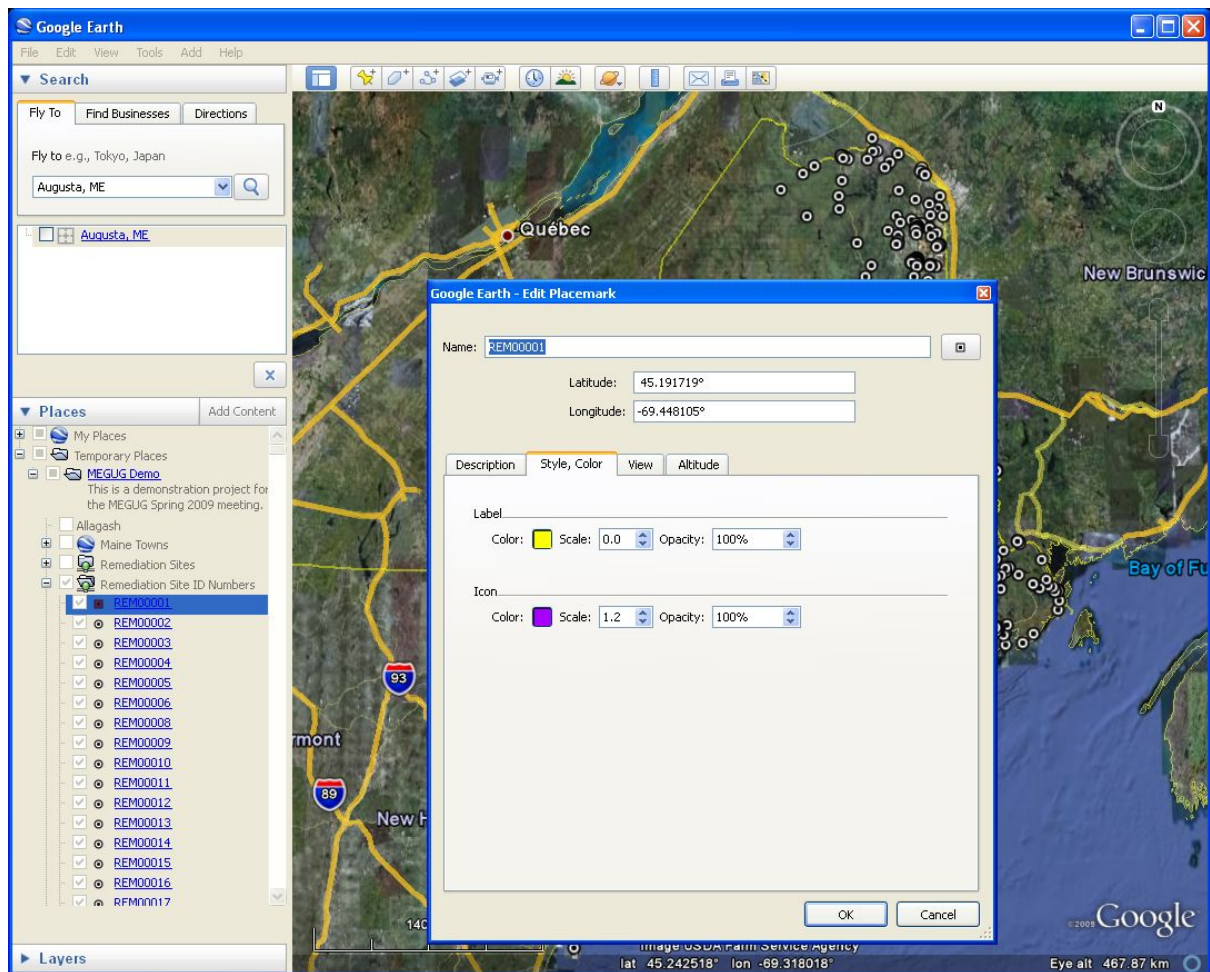
- Click OK and a new Screen Overlay is created.
- Zoom in to an area with the photos and notice how the WMS draws different resolutions of the photos.

## Layer Settings

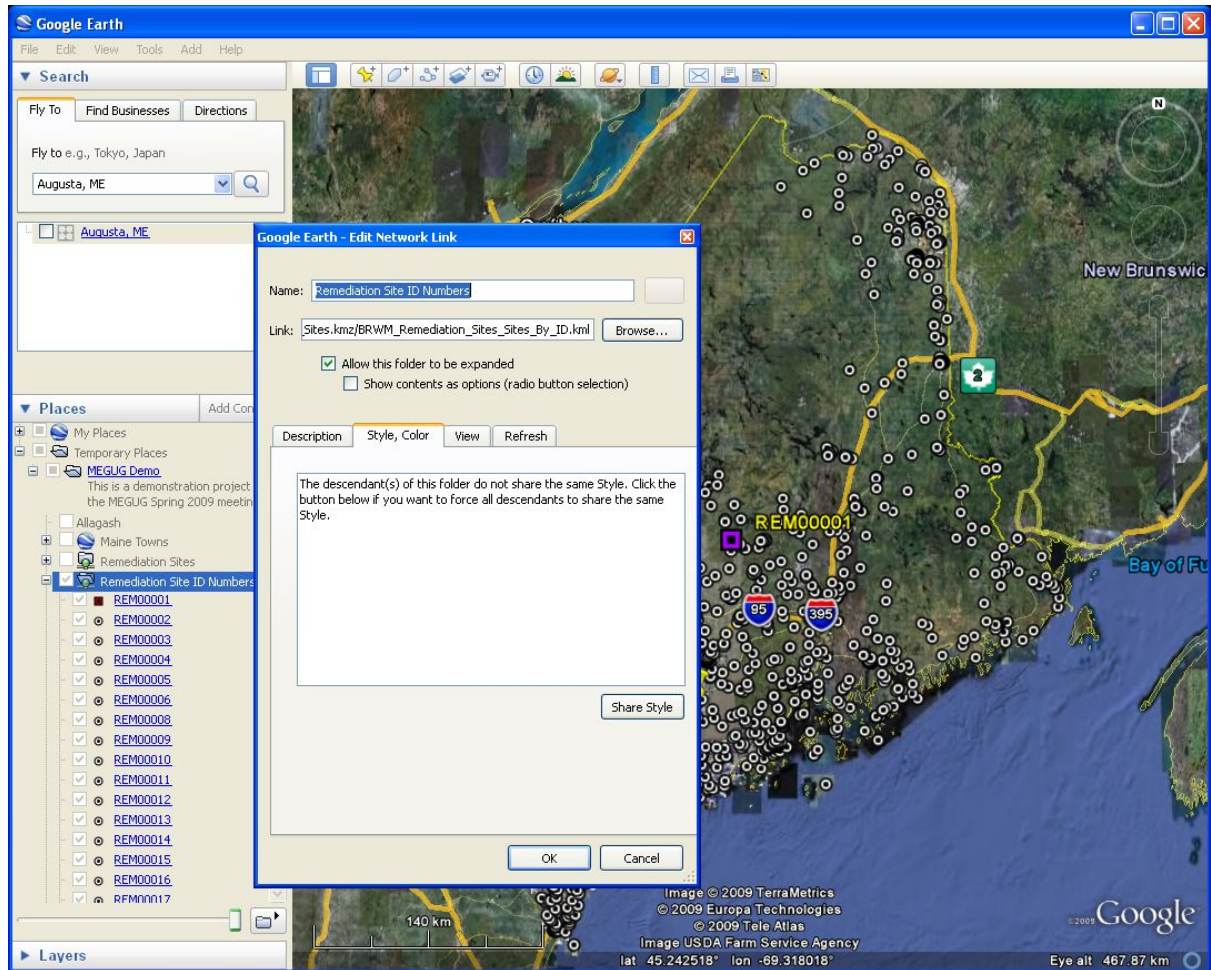
- There are a number of layer and feature specific settings that can be controlled through the Google Earth interface.
- These are all accessed by right-clicking on the layer and selecting Properties.
- Here are a couple of the more common and useful:
- Style and Color tab can be used to control line and fill color and weight plus opacity (transparency).



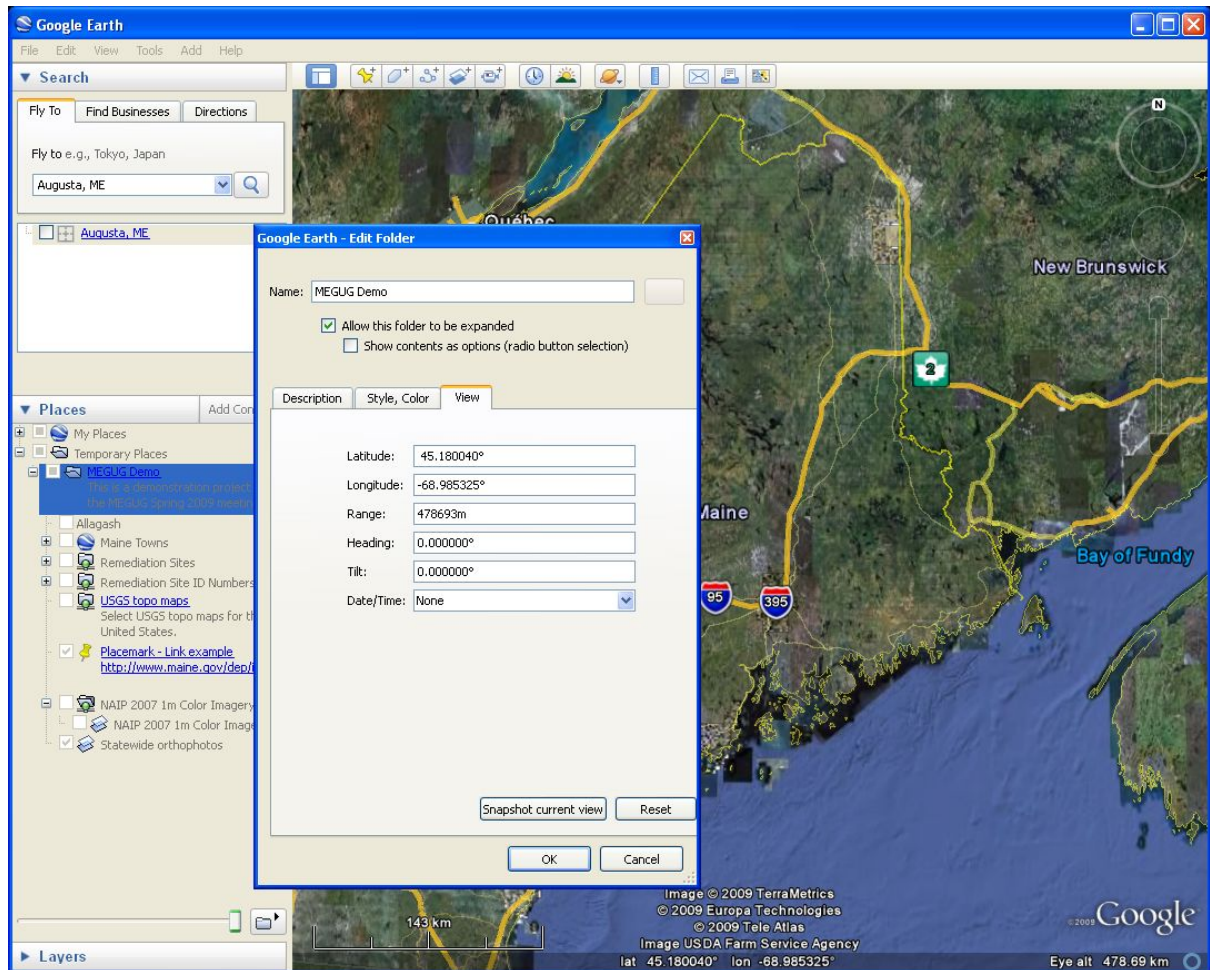
- A neat trick to change the style of a whole folder's features is to change the first one to the style you want.
- Here I've changed the first point of the Remediation Site ID Numbers to a purple square with a yellow label.



- Then select the folder, right-click and select Properties
- On the Style, Color tab select the Share Style button and the properties of all the features in the folder will be set to the same as the first one.



- When a KML initially opens it is good to have it zoom to an initial view extent.
- In the case of the MEGUG Demo project it makes sense to have it zoom to the state of Maine initially.
- Right-click on the header folder, the MEGUG Demo, and select Properties.
- On the View tab select the Snapshot Current View to set the center point Lat/Long and Range (which is equivalent to a zoom scale) and any Tilt or Heading you may want.



- Lastly, it usually makes sense to only have a certain default layers turned on when the project initially loads.
- Turn on those layers and then save the KML file again to the file name you initially selected and the layer visibility will be set.

## Other Tools

- I often get asked about other tools for Google Earth like creating grids, buffering features, getting area and length measurements or other specific needs.
- Remember that there have been over 400 million downloads of Google Earth and therefore there are millions of other developers thinking about how to do these same things.
- Do a Google search for the tool you are interested in. Chances are it is already out there.
- Here are a few that I've used in the past.
  - [UTM Grid](#) tool from [Nearby.org](#)
  - Point Buffer tool [Option 1](#) or [Option 2](#)
  - [Calculation of area measurements](#)
  - [Concentric Circles](#) from [Zonums](#)
  - [Free Geography Tools](#)

Finally, make sure to save the KML file again for the MEGUG Demo project. To test your project close Google Earth and double-click on the KML file from your computer to watch it load into Google Earth as a complete project.

### **Publishing Options:**

- Now that you have a completed KML file you will most likely want to share it.
  - This is a file that can be emailed to others just like any other document.
  - You can put the file on a network drive and send around a path to users you want to have access it.
  - You can post the KML file on your web server and then provide others the url or put a link on your web page for everyone to discover the file.
  - There are also web forums that host KML file like the [Google Earth Gallery](#) and the [Google Earth Community](#).
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